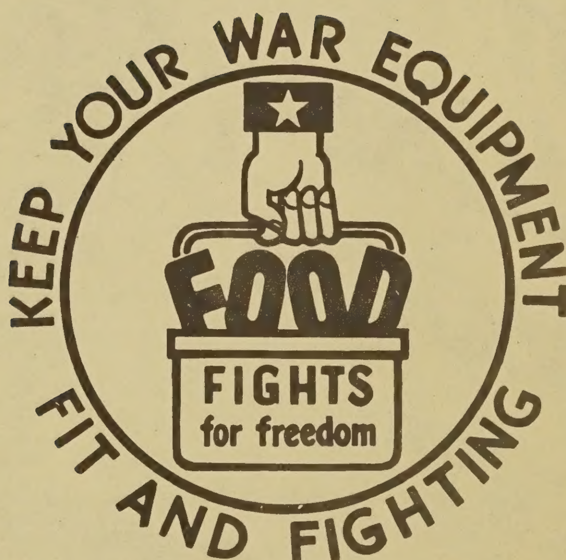
U. S. DEPARTMENT OF AGRICULTURE
EXTENSION SERVICE


KEEP YOUR WAR EQUIPMENT
FOOD
FIGHTS
for freedom
FIT AND FIGHTING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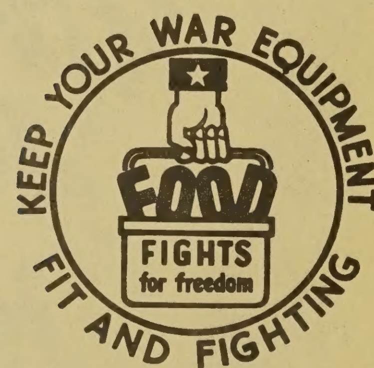
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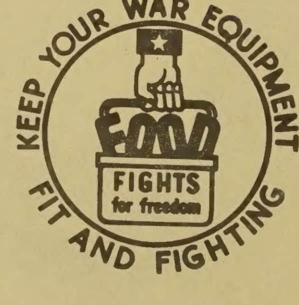
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FARM MACHINERY MANUAL

FOR COUNTY AGENTS

Labor and machinery are so critical this year that this manual has been prepared to assist you in telling farmers in your county how to keep their machines running efficiently and their unskilled labor whole and safe. We cannot afford, as a Nation, the costly break-downs of farm machinery that could be "written off" in peacetime. Neither can we afford the man-days lost through accidents. It is our belief that by stressing both these factors in your news and radio stories, in your letters and talks, you can reduce materially the machine-hour and man-hour losses in agriculture.

Earlier campaign manuals spell out clearly the methods and techniques by which your messages can be woven into news and radio releases to be issued by the county office. This manual covers another form of appeal. Many farmers have said that they don't have time to read long-winded letters in times like these. Because brevity is becoming important in other forms of communications, and for several other reasons, we will concentrate on a brief form - the post card.

Although not dealing heavily in humor, we believe that a little spice might make these serious messages more attractive to the farmer. We hope he will be attracted enough by the cards to want to tack them up in appropriate places about the farm where they will serve as constant reminders. You will notice that many of them have been slanted at unskilled labor. If the farmer himself adopts these safe and efficient practices, we won't object!

We have also included several full-sized letters issued in Wisconsin this year. You can adapt them to your needs, and we would suggest that you save those with early dates for next year, especially if the practices they recommend have passed their useful date.

Also included are dummies of several leaflets which have been sent to your extension editor and engineer. These contain the latest recommendations of the farm equipment engineers connected with Agricultural Chemistry and Engineering. They are included so you can reproduce them by mimeograph if your State office has not supplied them in bulk. Each is on a different piece of equipment, so you may select those leaflets applicable to your county's needs.

To conserve paper, all the suggested material has been printed on both sides of the paper. This saving requires the added steps of tracing the illustration first on tracing paper, then on your mimeograph stencil. We believe that you will be willing to assume this extra burden so we can provide you with twice as much material from which to choose.

If you have the equipment, two-color mimeographing could be used to enhance the appearance of the cards. The illustration could be run in red and the lettering in black, or vice versa. Use only strong colors and cut the stencils full and clean. Where broad areas of black are shown in the drawings, you can shade them with stylus or shading plate.

All cards have been laid out on the basis of conventional 4- by 6-inch post cards. Although copy for the face has not been included, you might consider the advisability of putting a script or lettered catch line on the left third of the address side of the card. Be sure to use no more than the left third, and be sure it contains the same theme as the other side of the card to comply with postal regulations. Suggested lines are:

Care--Share--Repair.

Read your instruction book again--and again.

Clean rifles make clean shooting.

Oil and rust don't mix.

Fingers are war tools; keep 'em.

A repair in time saves 99.

An ounce of prevention is as good as a block-buster.

He who relaxes is helping the Axis.

Schickelgruber likes broken-down machines---when they're ours.

Idle machines don't make crops.

There may be a better way of doing it.

Safety first is always best.

Save a step and save a day.

Minutes are precious; don't waste them.

Keep 'em rolling on the farm front.

More oil--less effort.

Feeding the warriors is important, too.

Now is the time for all good men----.

Think ahead and be ahead.

Play safe and you won't be sorry.

Think first and you won't be sorry.

Hit Hitler NOW.

Look before you step.

Use your head and save your tools.

Efficiency and safety go hand in hand.

Neglect and carelessness never saved a crop.

Fix it NOW.

Why take a chance?

Don't hoard--swap.

Make it last, do without; make it do, wear it out.

Not on stairs!

Hang it up.

Is your way really the best way?

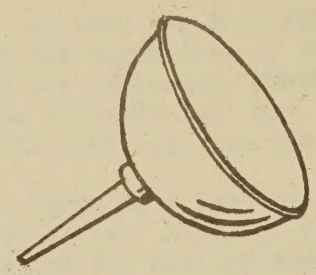
There is more time when you take time.

You will notice that many of these phrases apparently don't make sense, yet if you will go through the card copy in the following pages, you will see that these phrases on the front of the card can be a challenge to turn the card over and see the answer. Many of these phrases will also suggest themes for letters. Lift the appropriate illustrations from the card copy to illustrate them.

Although the major emphasis has been placed on post cards, the material in this manual can be adapted easily to letter forms in counties where those are preferred. We have tried to give you a large supply so you can choose ideas and suggestions that fit your needs. The contents cover subjects that seem important from this viewpoint. Some counties are using little volunteer labor; therefore ideas based on that premise will not fit in those counties.

For more complete promotion suggestions may we refer you to two manuals issued earlier, "Control Cattle Grubs" and "National 4-H Mobilization Week." Enough copies of these manuals were furnished all States to provide a copy for each county. Both these manuals contain ideas for promotion that can be adapted to any program.

A well-oiled machine runs smooth---



Farm machinery operates under severe strains and constant jars and jolts.

To keep it running, follow a well-defined lubrication scheme.

Every hour oil all high speed shafts and bearings; give grease cups one turn.

Twice a day fill the grease gun with clean grease, wipe off nipples, and fill each bearing.

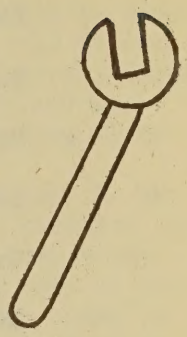
Every day brush oil on chains while turning machine by hand.

Wheel bearings need grease every day.

Mark all oiling points with a small dab of red paint, count them and paint the number in red where it is easily seen.

County Agent

Keep plows plowing.



Tighten all bolts regularly.

Check adjustments twice daily.

Check clearances before plow is needed.

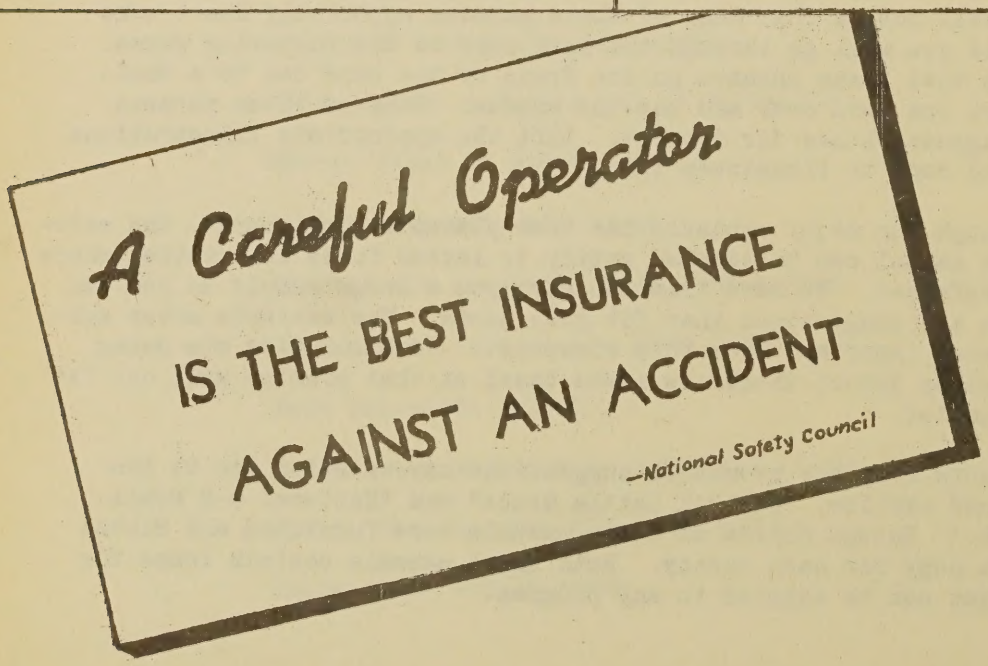
Sharpen or replace worn or dull shares.

Correct adjustment of plow and coulter means more work done well at lower power cost and with less strain.

Correct hitch means good plowing, easier plowing, and fewer breakdowns. Be sure break pins are soft enough to break. Don't replace with a hard pin. A broken pin costs less than a broken plow.

A copy of "Correct Hitches" is yours on request.

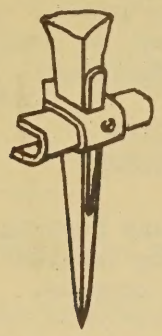
County Agent



Your printer can set this in type for you.
The top line is Kaufman Bold, the others Metro or any sans-serif face.
The border is regular rule stock.

Good harrowing makes a good seedbed

Is your harrow



in good shape?

The right hitch is important for good coverage.

Tips for the new operator:

Don't leave gaps or ridges.

Don't turn too short.

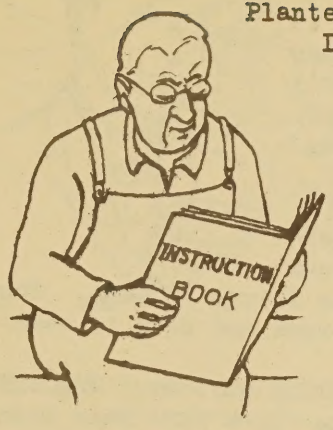
Don't hook harrow on tractor wheel when turning.

No riders.

(Should rollers be combined?)

County Agent

Planters--Seeders
Drills



On this equipment you are depending for a good start for your crop. Have you checked it over?

Make sure the seed tubes are clear and open -- no trash or dirt from last year.

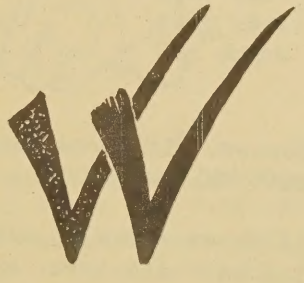
Lubricate as recommended in your instruction book. Paint drive chains with a brush and oil every day.

Make sure the adjustments recommended in your instruction book are correctly made before putting into use.

County Agent

Have you checked your cultivator? Replaced broken parts? Sharpened the shovels? Then you are ready for the new crop year.

Here are a few extra tips:



Why not make a supply of break pins before you go into the field?

Oil the spring trips well so they will function.

Check the hitch or line it up anew. The proper hitch will make the cultivator work better. It might be a good idea to check the lift, too, making sure it works properly.

County Agent

IT'S JUST HUMAN NATURE

A COUNTY AGENT is no different from other folks. He's just as full of human weaknesses as anyone.

You know, my letters haven't been the bestlooking things of late. They were a little weak and hard to read.

I got to wondering why, so I dug out the instruction book that came with the machine last night and read it right through. When I came down to the office this morning I checked a couple of points that had bothered me while reading, and darned if I didn't find a little dingus to turn. Now, just look at this card, how nice and even the ink is.

I bet if you got out some of your instruction books and went over them and your machines you'd find some dinguses that you had forgotten.

County Agent

No, it doesn't mean afternoon, although that's a good time to do it.

It's the symbol for something the manufacturers want us to do. It means -

PM

PREVENTIVE MAINTENANCE

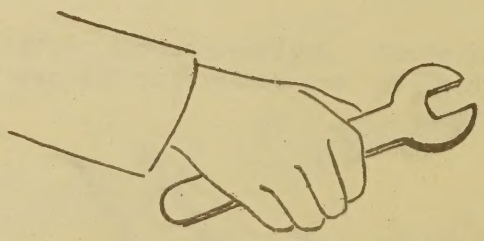
And that means keeping machines working by preventing trouble instead of waiting till it happens.

It means making use of odd moments when you can really take care of the machines on your farm. You can clean and oil them and make adjustments, so they will be ready to run when you need them.

It's like keeping your best suit pressed so it will be ready when you want to wear it.

I have some check lists that will help you in going over each piece of machinery you own. Want one?

County Agent

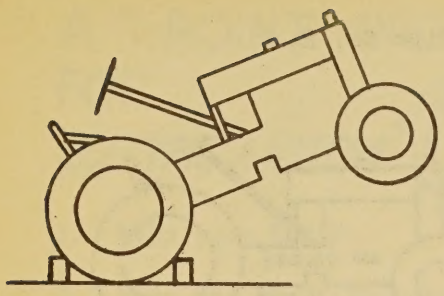


How often have you said, "Thank God, I'm an American," these last few years?

Being an American means a lot of things besides knowing the Star-Spangled Banner. It means being a good neighbor, sharing with the next fellow, helping him when he's in trouble.

In these times it means a return to the good old days, sharing machine hours, swapping spare parts, helping each other fix our machines, swapping ideas as well as metal. Some of us have forgotten to practice these ideals, but have you noticed how quickly we're picking them up again?

County Agent



WHERE ARE YOU WHEN THIS HAPPENS?

If you know your machinery, you're nowhere around. Because then you know that a tractor in gear can do this very easily. A little thing like raising its own weight is a cinch for a modern tractor. If it is blocked, in gear, this is bound to happen when you start up.

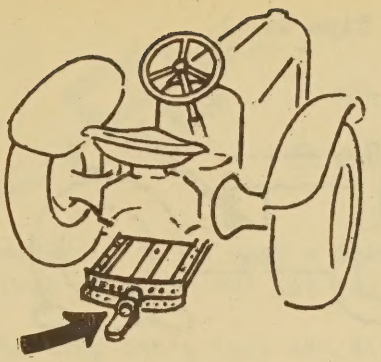
So-------

Always take the engine out of gear when stopping.

Never start the engine unless you check the gears to be sure they are in neutral.

Play safe always.

County Agent



THE ARROW marks the spot where you hitch! Of course you knew that, but you'd be surprised how many farmers don't seem to remember it.

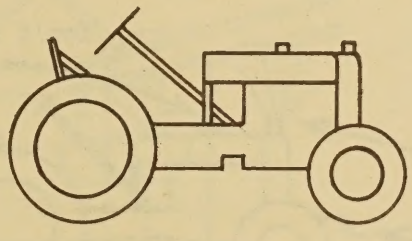
When you hitch there you reduce the the danger of the tractor's rearing up; you apply the load at the proper point; your attachments and other machinery work best; everything works out best--and safest.

Don't forget your tractor instruction book has some good suggestions about hitches in it. Look it over.

County Agent

A MIGHTY WAR WEAPON

Yours to fight the winning battle



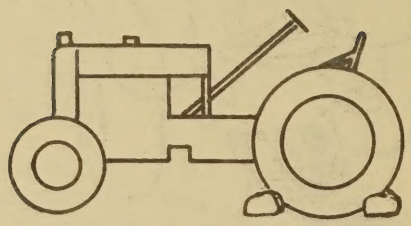
KEEP IT ROLLING

Your duty is to keep it in fighting shape.

Keep your tractor and other equipment in fighting trim. Make repairs early. Make a regular check-up. Follow the lubrication guide. Reread your instruction book and check the lubrication chart. You may find some places you've been missing. Put your equipment under cover for the winter and cover all bright parts with grease or rust-preventive material. Make sure all sharp edges on tools are greased and protected. Take care of your weapons and they'll take care of you.

County Agent

Tractor Tips No. 1.



Keep your tractor in good condition.

Put the gear shift in neutral before cranking.

Have the brakes on or the wheels chocked to prevent rolling when cranking, oiling, or making adjustments.

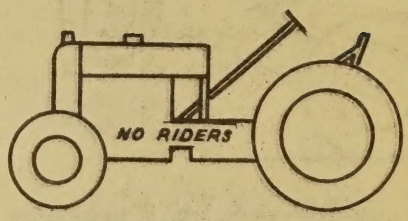
Before starting SEE that no one is in the path of the tractor.

Always keep the tractor under control.

CAN YOU STOP IT?

County Agent

Tractor Tips No. 2.



Allow NO RIDERS. The seat is the only safe place to ride a tractor.

Turn the engine off if you walk away for a moment.

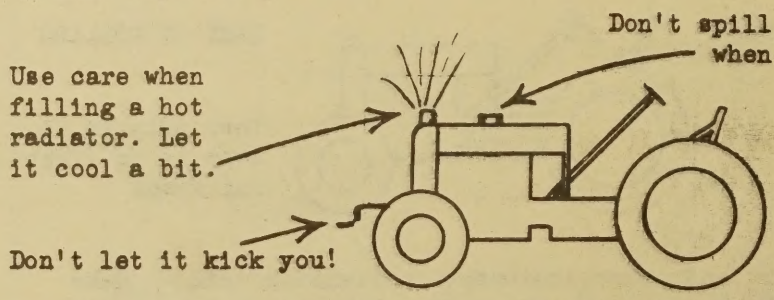
Keep safety shields in place. They may seem a nuisance, but working with only one good hand is more of a nuisance.

Use fenders.

Don't let anyone walk too close when you're moving. They may stumble.

County Agent

Tractor tips No. 3

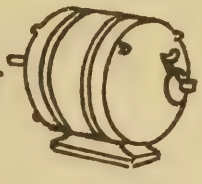


These are just common-sense measures.

Don't forget P.M. Keep trash out of the radiator.
Keep the air cleaner clean and filled with fresh oil.
Keep the oil filter clean or replace the cartridge as instructed. Keep oil off the wiring to prevent rot. Don't drive too fast.

County Agent

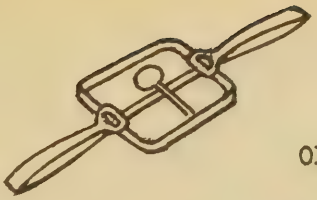
A 7-POINT PROGRAM FOR *ELECTRIC MOTORS*



1. Keep them CLEAN.
2. Keep the bearings lubricated according to instructions.
3. Keep them dry.
4. Do not overload.
5. Don't let them burn out.
6. Use correct-size fuse to protect the motor.
7. Play safe--good wiring; good connections; no dirt, grease, or waste to catch fire; and an extra belt if belts are used--also an extra fuse and brushes.

Take care of your motor and it will help you work. Motors are hard to replace; make them last.

County Agent



FOR MICE---

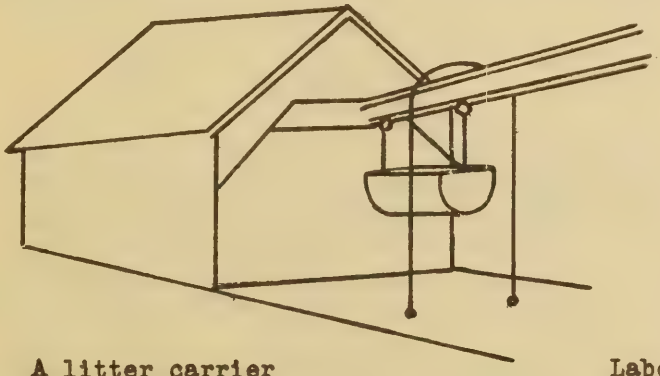
OR MEN---?

Pardon us if we show a rat trap and speak of mice--but you get the idea.

The trap can't tell the difference between your hand and a rodent's feet. We don't have the statistics at hand, but you'd be surprised at the numbers of hands that get caught by mistake.

Learn the safe way to handle traps, the only way. Then set them where the stock can't be injured but the rats can. And if the children are small, make sure the traps aren't put where little feet or hands can reach them. It might be a good idea to show the children what a trap can do by tripping one with a soft stick, then letting them feel the dents.

County Agent



A litter carrier

helps to keep

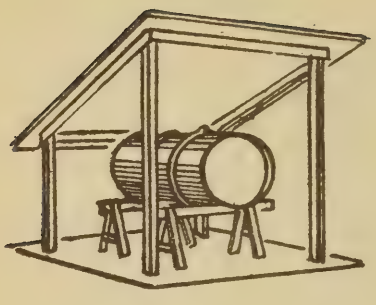
Clothes clean
Barns clean
Cows clean
Milk clean

A
LITTER
CARRIER

Saves back
Saves time
Saves fertility
Saves health

Labor saving is a good enough reason these days; but when a device can do these other things, too, it's a good one to have around, and to keep in good shape.

County Agent



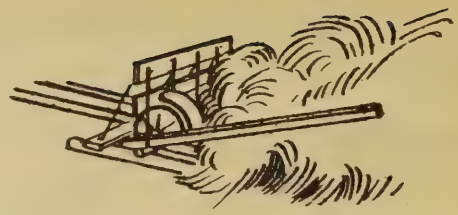
PICTURE OF A GAS SAVER

You'd be surprised how many more miles and acres you'll get to the gallon with this unpatented gasoline saver. It need not be attached to your engine -- works automatically.

Gas and tractor fuels are volatile; they evaporate easily. The heat of the sun, even in spring, will turn gallons of gas into vapor. That vapor does you no good. So defeat it by shading your tank.

When you build the shed, put it at least 75 feet from any other buildings, for fire protection. And if you can afford a concrete floor, that's better yet.

County Agent



Here's a time saver. Thousands of farmers have built buck rakes during the past year. A buck rake makes a quick job of haymaking and saves several hands. If your scrap pile didn't all go into the scrap drive you've probably all the parts on hand to make one.

Some fellows build them as an attachment for the front end of a tractor. Others make a "doodlebug" out of an old car with the rake permanently built on.

If you have a "boughten" one, take care of it; it's like money in the bank. Make sure it's tight and true.

If you want to build one, we have a set of plans for you.

County Agent

HEADS UP!

Yes, heads up when a hay fork is in the air. This most helpful tool can also be very dangerous. Those points dropping with the full force of gravity can penetrate substances more solid than hay with little or no trouble.

Young and inexperienced help might think the job of putting hay in the barn is exciting, but they should be made to understand that it can be dangerous too if they don't keep eyes aloft. It's just part of that proven pattern that with new help it's best to tell them, show them, let them show you, and check them. And be sure the telling includes the do's and don't's of safe ways to do the job.

County Agent

He put his fingers between the mower knife and guard. That's the wrong kind of V for Victory!

NEVER step in front of the cutter bar.

NEVER leave in gear when dismounting even for a second.

Always use a stick to clear grass.

Keep the mower oiled.
Keep the knives sharp.
Keep the lead right.
Avoid stones and stumps.

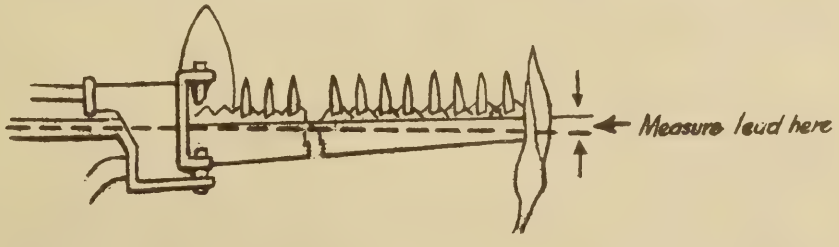
County Agent

He was standing in front of the reel! He didn't know enough to keep himself safe.

NEVER stand in front of mower bar.
NEVER stand under reel.
NEVER touch knives, guards, or reels when binder is in operation.
NEVER touch chains, gears, or canvas when in operation.
NEVER forget for a minute that a careful operator is a safe operator.

County Agent

A quarter-inch to the foot is the right lead---



The mower bar should lead so that when working it is forced back into a straight line. Tie a string on the pitman; line it up with the pitman bar; measure the lead at the outer edge of the bar with a ruler.

5-foot bar - 1¼ inches.
6-foot bar - 1½ inches.
7-foot bar - 1 3/4 inches.

County Agent

Success
story

This boy operated a combine successfully because the farmer who hired him taught him to be a good tractor operator first, then taught him how to operate and care for his machinery. He taught him safety and a lot of the common sense the farmer had stored up over the years.

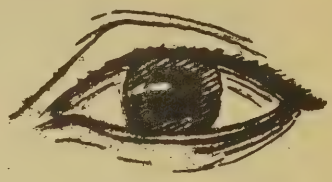
1st - Teach the Why
2d - Teach the How
3d - Teach the When

-- and you'll be satisfied with your VFV helpers. And at all times teach safety.

County Agent

P.S. I bet those boys and girls can find good reading in the old instruction book. You, too.

This is an irreplaceable kind of farm machinery



You don't have to be a sissy to wear goggles when doing many kinds of jobs. Good safety goggles have saved thousands of eyes. Wear them on these jobs.

Threshing — Chipping metal

Field work when dusty and dry

Grinding — Feed grinding

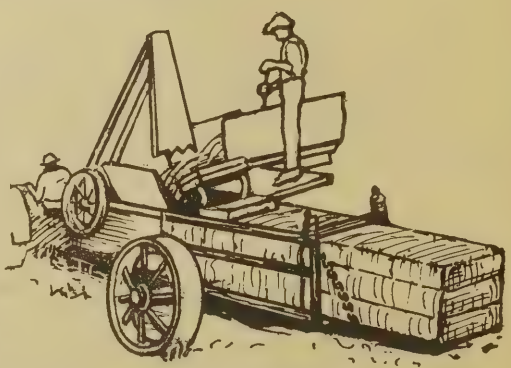
Using power saw — Welding

Blacksmithing

Any job where dust, chips, powder, chaff, small grain, or chemicals are handled.

County Agent

Perfectly safe--if you know what you're doing!



A power hay baler can do a lot of damage to a man who doesn't know his way around.

But it's perfectly safe if the equipment is in good condition, if care is used in feeding, if you keep away from moving gears, and if you are careful in placing the "blocks." With a green crew it's best to take a few minutes the first day and have a "dry" rehearsal to be sure every man knows his job and where he might get into trouble.

County Agent

OUR PART IS SAFETY

We do things this way on this farm.

1. We bring machine to a full stop before cleaning, oiling, or adjusting.

2. We keep hands and feet AWAY from working parts on all machinery.

3. We keep mittens and clothing AWAY from belts and chains.

4. We close covers and put guards back in place before starting machine.

5. We NEVER handle gasoline near a lantern, fire, or any flame, or start an engine where gasoline has been spilled.

We do these things because we have a war job to do and safe practices will enable us to keep on doing it.

Cut my name off and hang this card where it can be seen.

County Agent

War Doubles Danger on the Farm Front

Where?

In the home.
With machinery.
Handling stock.
Doing chores.
In the barn.
With ladders.
Filling silo.

When inexperienced help takes the place of trained people, we must all be doubly careful to make sure they know the hazards. Many hazards can be removed by repairs. Others are hazards only when not recognized.

Have you checked all your risks? Are you prepared to warn your new help about hazardous operations? There are plenty of safety helps available. I have some; your machinery dealer has others.

Double the precautions and reduce the dangers.

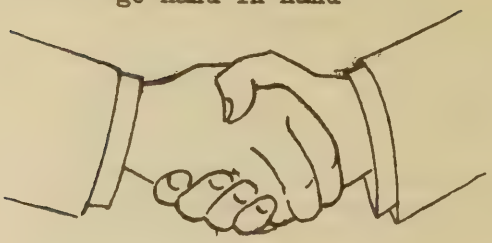
County Agent

ARE YOUR REPAIRS FINISHED?

It has always been good business to have repairs completed during the slack season. It's still not too late to get yours done. If you haven't checked all your machines, drop in at my office the next time you're in town, or drop me a card and I'll supply you with check lists for all your machines. Check them right away, and get your parts orders in if you haven't done so already. Next in importance are lubrication and cleaning. Use any slack time you may have to get these two important jobs done so you'll be ready to roll. I'm always glad to help with any advice or information. Drop in or write.

County Agent

SAFETY and EFFICIENCY
go hand in hand



NEGLECTED MACHINERY

is <u>costly</u> and <u>dangerous</u>
to operate.

Lack of lubrication means more power is needed

Lack of lubrication means earlier break-down

Broken parts cause others to break.

Repair now, and lubricate as you use. Your machines will repay you in more efficient work and will be safer to operate.

County Agent

KILL THESE TWO BIRDS

with the one stone.

NEGLECT and CARELESSNESS have killed more farmers than bullets have killed. We need every skillful hand in these important days. Keep your machinery in tiptop condition and don't relax for a minute. Keep yourself operating with all your parts. Uncle Sam needs you as never before. A day lost now may mean a crop lost later. Our boys need your crop to fight on.

County Agent

How long since you read it last?

It's really surprising how many new things you can find every time you read the instruction book. You'll find little tricks you had forgotten, places that should have been oiled -- and weren't, and a lot of things that will surprise you if you'll dig up the book right now and read it tonight. Try it just once and you'll become a Constant Reader.

In case you can't find it, and many of us can't, I'm sure your dealer can supply you with a new one, or can get it in a few days. Most of the equipment companies are reprinting instruction books just because farmers want to Keep 'em Rolling.

County Agent

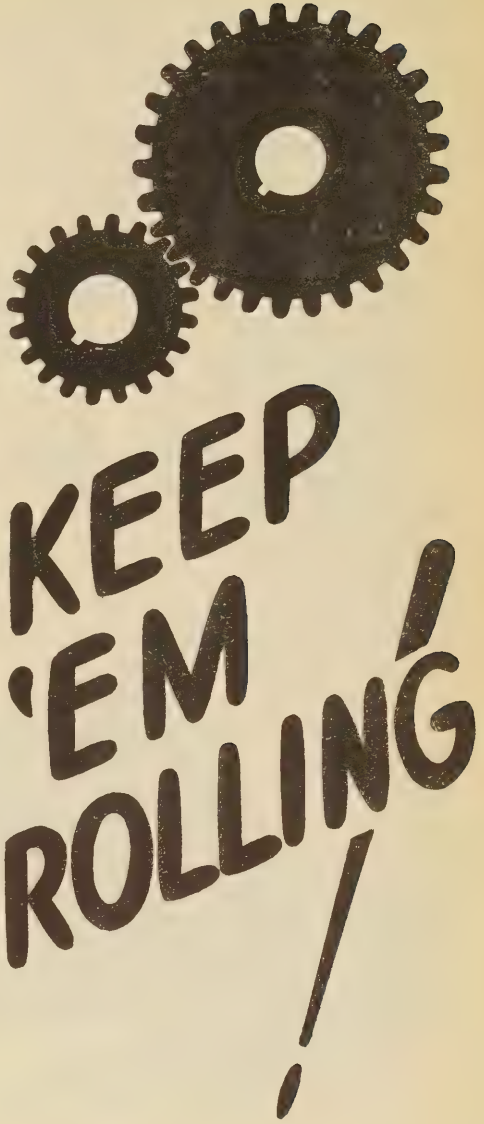
PM--preventive maintenance--is just another way of saying we prevent breakdowns by making the repair before it is needed, by oiling and greasing regularly, by keeping bolts tight, and by having every machine adjusted for best operation.

Wise farmers are practicing PM. They know repair parts are hard to get, that time may be lost in the field. They have adopted a regular schedule of lubrication, inspection, and adjustment.

This leaflet, prepared by engineers of the Agricultural Research Administration of the United States Department of Agriculture, lists the basic elements of PM. Other leaflets about particular machines have been prepared by them and by the engineers of your State extension service. Ask your county agent for his check lists, machinery leaflets, and bulletins. He may be out of them but he can get more right away.

The leaflets, together with your instruction book, will help you get the maximum use out of your equipment and will help you prevent the costly breakdowns that a nation at war cannot afford.

Prepared by R. B. Gray, agricultural engineer, Agricultural Research Administration, U. S. Department of Agriculture.



Day-to-day systematic inspection of farm machines as a means of extending their useful lives is comparable to the periodic physical examination of human beings for longevity. This is a good policy at any time, but is especially important now that both time and metal are extra valuable. Daily care and small repairs prevent costly breakdowns and losses at a critical time when the loss of whole or part of a crop might result.

Preventive maintenance is systematic checking to see that all parts are in good working order - not stiff in the joints, not loose, not rough with rust, not out of adjustment; to see that there is oil or grease in all the right places to reduce friction and wear and save time. Specifically, where there are pressure fittings the gun should be held on till grease shows at the edges of the bearings; reservoirs filled with lubricant as the maker recommends; and roller and ball bearings and dustproof boxes cleaned and refilled.

Not only does oil prevent rust and reduce wear, but wrenches, almost as simply, keep bolts and nuts tight. Many breakdowns can be avoided by keeping bolts tight and replacing lost or broken bolts. It is also important to have all cotter pins in their proper places, and be sure they are split so they'll stay put. A lost nut may mean a lost day, or $10 lost, or both.

Paint is another factor in the upkeep of all farm machines - paint and housing together. Machines need housing even though idle for only short periods, but paint provides needed protection at all times, even additional protection when machines are under roof.

A good insurance against breakage is an ear attuned to the normal healthy hum of each particular machine. Farmers who know their implements are on the alert for unfamiliar noises - squeaks, rattles, bangs, and thumps - and for smells that suggest undue heating of some part.

No matter how the parts of a machine are driven - by ground wheels, power take-off, direct engine drive, or electric motor - it is a good practice to follow the course through the various clutches, ratchets, gears, shafts, sprockets, and chains, in a search for any place where trouble might begin soon.

The farmer who intends to come back next fall with extra tonnage will start out this spring with machines in extra good condition.

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Plowshares are swords.

Never has the truth of this been more apparent. The plow is a war weapon today.

Agricultural engineers have found that the plows on most farms are not adjusted properly for efficient work. A wrongly set plow wastes power, doesn't do a good job, and can even lead to breakage.

This circular tells you some of the things you can do about your plow. Your county agent can tell you others. He has helpful literature that may just fit your problems. Why not see him and find out?

This circular was prepared by farm machinery specialists in the Agricultural Research Administration of the United States Department of Agriculture. Other information has been prepared by your State extension agricultural engineer.

See your county agent.

Prepared by I. F. Reed, agricultural engineer, Agricultural Research Administration

PREPARE THE PLOW

The share and moldboard of the plow are very likely the most important steel used on the farm. If they do not get the best of care the whole process of crop production is on a poor foundation. Shares must be sharp and the same shape as when new. It is well to measure the land suction and down suction of a new share so that the repair man can shape the old share correctly. If at all possible, keep on hand at least two sharpened or new shares for each bottom. It is the best insurance against delays that might put the whole crop year out of joint.

If the moldboard surface is not smooth or is badly worn, better order a new moldboard unless the worn places can be rebuilt. Keep moldboard and shares well polished to aid efficient operation and when not in use protect the polished surfaces with grease or oil. Rust eats metal and time.

Unless it has a sharp edge, the rolling colter is nothing more than a wheel that rides over trash and interferes with good plowing. Keep it sharp and it will speed the plow and help do a better job of covering. Replace badly worn bearings; a true running colter does a better job. Sharpen with an emery wheel or grindstone. If a moldboard-type jointer is used make sure the fastenings are secure and the point is sharp. A sharp jointer helps it do better covering. The jointer point should be the closest part to the colter to avoid jamming with trash.

Clean all wheel boxings and bearings with kerosene and put in fresh lubricant. Many people have grown up with the notion that grease is unimportant on plows except to prevent rust, but every turning part needs it and it is a factor in wear and draft. Replace badly worn parts. If there is excessive play of the wheel on the axle install a new collar, bushing, or bearing. Check the wheels for loose spokes, and sprung or broken rims. Check the frame and frame parts to see that all bottoms (in the case of gang plows) cut the same depth and width.

See that the hitch is in good condition. Check the coil spring and latch on spring release hitches and keep on hand a supply of extra wooden pins for break-pin hitches. They don't cost much and if there is always one on hand costly delays will be avoided. Do not substitute bolts for wooden pins, or bad breakage is liable to result.

But be sure there are no bolts missing where they are required, and have all of them tight. Few farm machines are so continuously under strain while working as a plow. It is fortunate the plow is simple and so easy to repair - if the parts are on hand.

We might revise one of Benjamin Franklin's sayings and say "Plow right while soldiers fight"

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For the smaller disk plows and the general-purpose tractors with the tread narrowed down, the right rear tractor wheel is usually put in the furrow. With the tractor in the desired position the hitch is shifted horizontally on the front frame member of the plow so that the front disk cuts the proper width of furrow in conformity to the width of furrow cut by the adjacent disks on the unit. The hitch bar is then attached to the tractor and the steering arm for the front furrow wheel of the plow is lengthened or shortened so that the furrow wheel is parallel to the furrow wall or with a slight lead to the plowed land. If the rear of the plow tends to swing out of the furrow toward the left, the pull bar should be shifted horizontally to the right on the front frame member of the plow and the tractor drawbar. Weights added to the rear furrow wheel will assist in holding the plow in its proper position.

The hitch should be adjusted as low as possible on the front of the plow and yet keep all the disks cutting uniformly at the desired depth and keep the framework in a level position. The land wheel should run straight forward parallel to the line of travel.

When the disk plow is put aside, even for a day or two at a time, coat the disk blades with oil. Used crankcase oil may be put on with a brush or rag. If the disk blades are lifted clear of the soil and any adhering soil is removed they will stay in better condition.

Frequent lubrication pays for the effort. Pressure grease fittings and a pressure grease gun will be found more effective than the conventional grease cups.

Prepared by E. D. Gordon, Agricultural engineer, Agricultural Research Administration, U. S. Department of Agriculture.

DISK PLOWS

The standard disk plow and the vertical disk plow are becoming common in many localities where the soil is extremely hard or is too sticky for the moldboard plow. Use has increased with improved design and revision of field practices. It is important to take the best of care of these machines to save as much time and labor as possible.

Check the frame of the plow and all lift links, axles, and brackets. No part should be left bent or pulled out of line. Badly bent parts may require the services of a well-equipped shop, or a new part may be needed.

Check disk bearings and wheel bearings. If antifriction bearings are used, clean them out, insert new felt dirt seals, and be sure they are well filled with clean grease after being reassembled. If chilled cone bearings are used, they should be replaced with new cones if worn. It is well to have extras on hand. If the plow is equipped with plain wheel bearings and they are badly worn, they may be rebushed with renewable bushings which many companies provide. The thrust bearings on the vertical disk plow have considerable chance for wear and tear and need checking as well as the disk axle bearings.

Take apart the power lift mechanism and clean it. Replace any parts showing bad wear or damage. Some local repair shops can weld or build up small parts at reasonable cost.

Disk Scrapers

Scrapers of either the moldboard or hoe type are furnished as regular equipment with most standard disk plows. Considerable range of adjustment is provided by the bracket. Adjust the scraper to run close to the face of the disk with the point directed toward the center of the disk but with enough clearance to prevent excessive friction and wear in case the disk blade does not run true.

Sharpness of Blades

Sharpen dull disk blades or have the work done at a local repair shop. When disks are worn down 8 to 10 percent it is time to replace with new ones. Do not use new blades on the same plow with blades whose diameters have been greatly reduced by wear. A sharp disk requires less draft than a dull one.

Hitch Adjustment on the Disk Plow

Specific information on hitch adjustment cannot be given for either the standard disk plow or the vertical disk plow. On both, the center of resistance continually shifts under field conditions because variations in soil texture and moisture.

In general, the hitch adjustment is made in this manner: First, make one round of the field with the plow set so that the rear disk blade is cutting a fairly good furrow. Stop the plow with the front furrow wheel of the plow in the furrow cut by the rear disk on the first round, regardless of the position of the tractor. Unhitch the tractor and drive into position in front of the plow so that the center line of pull of the tractor coincides as nearly as possible to the center line of draft of the plow, which for practical purposes may be considered to be the center of the width of cut.

It is more important than ever before to have our machinery in good shape. Even if you still have your regular help, they can do more work if they don't have to stop and make repairs that could have been made before field work started.

If you're using emergency help they don't know how to make repairs, so don't put off checking and fixing up all your machinery until it's too late.

This leaflet was prepared for you by experts of the Agricultural Research Administration of the United States Department of Agriculture. They and your State extension engineers have prepared leaflets covering all farm machinery. Ask your county agent for these helps. He has them, or can get them for you.

Prepared by R. B. Gray, agricultural engineer, Agricultural Research Administration, U. S. Department of Agriculture.

Pointers on HARROWS

Harrows are among the simplest of farm machines. The harrow might be said to be one of the links between hand tools and the more complex power tools. But its efficiency depends greatly on having all parts in good working order in any one of the three types -- spike-tooth, disk, and spring-tooth. The following paragraph emphasizes care and repair points on all three:

SPIKE TOOTH: -- Straighten bent tooth bars and frames by removing and hammering on anvil. It is not necessary to heat these parts. The front or cutting edge of the teeth and the point must be sharp. If all edges are dull and cannot be turned in the clamp to a sharp edge forward, then they must be removed, heated to a dull cherry red and reshaped on the anvil. Another way to reshape them is by grinding. If a tooth is worn too short to be set as deeply as the others, then it must be replaced. For good soil working all teeth must be set for equal penetration and so spaced on the tooth bar that no tooth trails another See that all teeth are tight, and replace broken clamps and lost teeth

Control levers, ratchets, quadrants, and rocker arms must be put in condition so tooth bars can be angled easily. All bolts and nuts must be tight.

Hitch connections must be ready to stand the strain.

DISK -- Remove all dull disks and sharpen by grinding on the outer or convex side, but do not grind too fast and overheat as that destroys temper. The disks may be removed by unscrewing the nut from the end of the arbor bolt and then taking off alternately the several disks and spools. After sharpening they should be replaced as taken off and the arbor bolt firmly tightened and the nut locked in place. Arbor bolts must be tight at all times. Clean out bearings, replace if badly worn, and oil. Test the oil tubes to see that the oil passes through them easily. The bearings may be tested for excessive wear by prying the frame up lightly, placing one end of a 2 by 4 on an adjacent disk and noting any movement. Replace any badly worn bearings. See that no bolts are missing and that all bolts and rivets of the frame, bearing standards, braces, weight pans, and other parts are tight. Repair and tighten the weight pans.

Replace badly worn scrapers and adjust them so they are in a working position about 1 inch from the outer edge of disk.

Have the snubbing blocks in position so the gangs will run level.

Don't overlook control levers, hitch parts, braces, and connections, or a single bolt for this machine will be subjected to much strain.

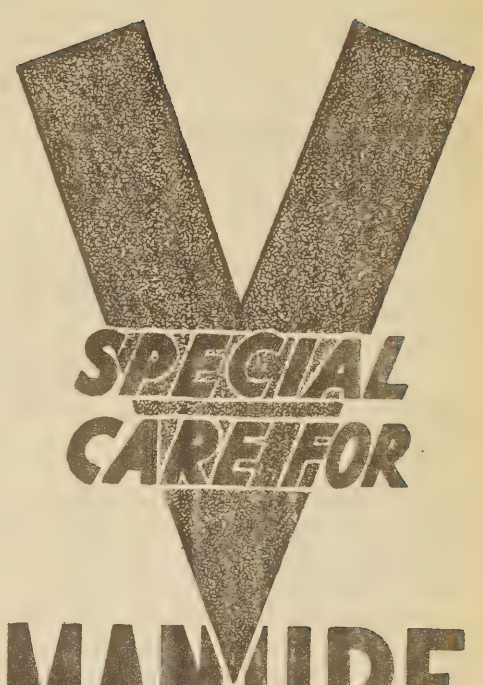
If the harrow is equipped with a tongue truck examine the wheels and replace badly worn hubs or bearings and be sure to grease them well.

SPRING TOOTH -- Sharpen or replace worn teeth. This is an important point. Grind them on the back side or, if badly worn, restore them to the original shape by forging. But do not heat above a cherry red and temper by allowing the steel to cool without quenching. Some harrows are fitted with detachable points which may be turned end for end or replaced without requiring much new steel.

Set all teeth to the same depth by pulling the lever back until some of the teeth touch the floor and then adjusting the others to touch. Check the position of the teeth and see that no teeth trail those immediately ahead, and have all clamps tight.

Examine the frame, frame shoes, draft bars and hooks, and tooth bar standards, and straighten, repair, or replace as necessary. Check control levers, ratchets, and rocker arms for proper functioning.

If the harrow is of the "roll-over" type check it for freedom of rolling.



MANURE SPREADERS

Prepared by R. B. Gray, Agricultural Research Administration,
U. S. Department of Agriculture

Many farm machinery men say the manure spreader is subjected to more abuse than any other farm machine. A great deal of damage could be avoided in starting the spreading mechanism after it has been idle for some time or if it is frozen up.

To put the spreader in good order, adopt the following procedure:

Jack up the front end and examine the front wheels for bearing wear.

Replace damaged parts, adjust, and make sure the bearings are lubricated.

Examine the front running gear, and make necessary repairs. Adjust and lubricate all pivot points and rubbing parts.

Jack up the rear end so the wheels run free. Put the driving mechanism in gear and check the performance of the various driven parts by turning one wheel by hand.

Remove the rear wheels and examine the bearings, pawls, and springs and adjust, repair, or replace as necessary. Lubricate the bearings.

While the wheels are off, examine the apron, beater, and driving parts and test the bearings of all shafts for wear. Check feed pawls and springs and replace if necessary. Examine the ratchet wheel and clean the teeth with a wire brush or screw driver, and kerosene.

Examine front conveyor shaft bearings and sprockets. Replace, if necessary, and oil. Check the links of the conveyor chain, and replace any that are worn or cracked. See that chain has the proper tension for firm operation without excessive wear. Straighten any bent conveyor slats, and see that there are no loose connections between the slats and the conveyor chains.

Inspect the beaters and the device for widening the spread, and make any necessary repairs. If beater teeth are bent, loosened, or lost, they must be straightened, tightened, or replaced. The beater chains may have badly worn or broken links which should be replaced.

It is important to have chain tension right and idlers working well. Use an old paint brush to paint the chains and idlers with discarded crank-case oil.

Repair any wooden or sheet-metal parts and paint them. Have all bolts and nuts in place and tight.

See that the hitch -- for horses or tractor -- is in good order and all control levers, ratchets, and rods are in repair and not too badly worn.

On spreaders driven through power take-off from the tractor give the driving members special attention and keep them lubricated.

This much-abused machine will last far longer if kept under cover as much as possible, freed regularly of accumulations that might dry hard or freeze, painted occasionally, and oiled frequently.

With fertilizer as scarce as it is, the job of every farmer is to see that he gets the full benefit of every pound that goes on his fields.

One way of doing this is to have the fertilizer machines in tiptop shape and properly adjusted to the particular crop.

This circular, prepared by agricultural engineers of the Agricultural Research Administration, United States Department of Agriculture, will help you do just that. Your county agent has other literature, prepared by the extension engineers in your State. Ask him for it.

Ask your county agent also for other circulars about your other farm machines. You will find them helpful in keeping your equipment working in these days when new machines are hard to get and good yields are more important than ever.

KEEP 'EM ROLLING ON THE FARM FRONT!

Prepared by G. A. Cummings, agricultural engineer, Agricultural Research Administration.

Fertilizer Machines

of changes in the condition of the fertilizer. The feed may be checked or set without a preliminary trial by weighing the fertilizer required to refill the hopper at the end of one or more rows the total acreage of which is known. The acreage covered by each bag of fertilizer should be observed as a periodic check on the fertilizer feed.

Tilting the machine forward or rearward, as occurs on sloping land, affects the rate of application. Such possibilities should be determined and adjustments made when practicable.

The depth of the fertilizer in the hopper has a bearing on the amount dispensed by some machines; thus the hopper should not be completely emptied each time before refilling.

Granular fertilizers, which flow more freely than the completely or partially powdered ones, sometimes flow through when the machine is not in motion. Some implement manufacturers have provided against this difficulty. Uncontrolled flow of fertilizer is wasteful and should be corrected.

For average conditions adjust the machine to place the fertilizer in a band 2 to 3 inches at each side of the row and at least 3 inches below the soil surface for such crops as beans, corn, cotton, tobacco, potatoes, and tomatoes. For peas and some other crops grown in closely spaced rows the fertilizer band should be only 1/2 to 1-1/2 inches from the row. A band at only one side of the row has given satisfactory results with most crops. For such crops as sweetpotatoes grown on sandy land the fertilizer band should be farther from the row, possibly 4 or 5 inches. Consult local agencies on the best methods of application for specific cases.

measured distance. The travel required to cover either a certain part or all of an acre depends on the width served by the hopper. The number of square feet per acre (43,560) divided by this width in feet gives the travel in feet for the coverage of one acre, from which any fractional part of an acre can be readily calculated. For example, if a hopper applied fertilizer for a strip 3 feet wide, the distance traveled per acre would be 43,560 ÷ 3, or 14,520 feet. The travel for one-hundredth of an acre is 14,520 ÷ 100, or 145.2 feet.

The wheel diameter multiplied by 3.14 equals the distance around the wheel. However, the circumference can be measured with a string and the string measured with a rule. Wheel slippage of 10 percent may be considered average. Therefore, 10 percent should be added to the circumference measurement to get the distance traveled during one revolution of the wheel. For example, the circumference of a wheel 3 feet in diameter equals 3 x 3.14, or 9.42 feet. Increasing this circumference 10 percent equals 9.42 + .94, or 10.36 feet, the distance traveled during one revolution. If 14,520 feet must be traveled to cover one acre, the required revolutions of the above-mentioned wheel would be 14,520 ÷ 10.36, or 1,401.5. The revolutions for one-hundredth of an acre would be 14.01. For an application of 500 pounds per acre the feed should be adjusted to deliver one-hundredth of 500, or 5 pounds, during 14.1 revolutions of the wheel. On some machines only a few changes can be made so that only approximately the desired amount can be spread. Some machines must be adjusted in the field.

Even though the fertilizer feed is set before going into the field, the actual rate of application should be checked under field conditions, not only at the beginning but from time to time. This is because

By keeping fertilizer distributors in good working order, especially by fighting corrosion, you can put crops in at the right time, and yields may well be better. Almost certainly time will be saved when hours mean bushels and days mean tons.

Care.- Fertilizer chemicals collect moisture and tend to corrode and even destroy metal parts. Sometimes they harden and cause breakage in the driving mechanism at the beginning of the season, a disastrous start when parts are hard to get.

Thorough cleaning with a brush or a jet of water will prevent such damage. It is a good plan to do this even if the machine is to be idle for only a few days. When it's to be out of use for some time coat the metal parts with used crankcase oil, varnish, or shellac. Having the machine clean and open is the most important factor, but there may be other broken or badly worn parts. Get in the order for new parts without delay. If you can't get them or time is too short, try to have parts made locally. All wooden and exposed metal parts will last longer and remain in better condition if kept painted. Not only does paint provide protection against the weather but against the corrosive action of the fertilizer. Oil or grease is better on the close-fitting movable parts and scoured surfaces of the soil-working tools.

Repair.- Because of the corrosion factor, repair work is essential on most of the weakened parts before breakage occurs. Give special attention to -

Hopper and dispensing mechanism: Take down and inspect all parts. Examine metal hopper walls especially where attached to the base, the rotating or oscillating feed plates and reciprocating or vibrating pans

made of sheet metal, the quantity control mechanism, and the agitators. Thin cast-iron parts, including star and finger-type feed wheels, quantity control gates and shields, agitators, and drive gears are particularly subject to breakage. Dispensing mechanisms consisting of endless canvas belts and metal chains should be replaced if the metal parts are weakened or frozen by rust.

Delivery tubes: Steel delivery tubes should be replaced when damaged, stretched or badly rusted, and rubber tubes when hardened, cracked, or deformed.

Driving mechanism: Parts of the driving mechanism most likely to require attention are chains and light cast-iron gears. Badly worn or rusted chains should be replaced. All gears should be examined for bad teeth. Excessive wear is likely to occur in driving mechanisms of the ratchet, cam, and knocker types, particularly on the teeth or engaging parts. Often parts must be reshaped or replaced.

Bearings: Excessive wear in bearings causes improper alinement and clearances of the rotating gears, sprockets, and shafts. Look for such cases and for clogged oil or grease channels. Clean the oiling system, and tighten or replace the bearings.

Placement devices and furrow openers: Shovels and shoes or blades ordinarily do not require repair except when badly worn. Disk furrow openers are likely to have worn

bearings and clogged oil tubes. In the case of fertilizer depositors with a valve, the movable parts should be examined for wear, breakage, and corrosion which would cause leakage of fertilizer past the valve, failure of the valve to close, or excessive friction.

General Precautions: Taking down certain parts of fertilizer distributors may be difficult as a result of corrosion, and care is necessary to avoid breakage. Light cast-iron parts should not be directly struck with a metal hammer unless a piece of wood is first placed against the part to be removed. It is sometimes desirable to loosen a part with kerosene or by heating.

Cleaning and care will greatly reduce repair work. After the machine has been in storage its operation should be checked by turning the wheels by hand. Failure to insure free movement of all parts prior to field operation is a common cause of breakage and delay at a critical time.

Calibration.- On this machine adjustment is a way of making money. For most of the larger machines initial adjustment for rate of flow can be made by turning the drive wheel a predetermined number of revolutions and weighing the fertilizer that comes out. Then the rate can be changed as required. For simplicity find out the drive wheel revolutions equivalent to the coverage of some convenient fraction of an acre, say a one-hundredth part. In any case the sample of fertilizer to be weighed should be large enough to assure a fair degree of accuracy.

The number of wheel revolutions can be determined by counting while operating the machine over a

check the pump same as fan and see that its shaft has pliable packing. Examine the thermo-siphon and any water temperature control devices. Use care in removing and replacing cylinder head gaskets. In no case use a chisel to break the cylinder head loose. CAUTION: Always use clean water (soft water preferred), and never pour it into an empty cooling system when the engine is hot.

Steering.- Jack up the front axle and turn the steering wheel to find any interference with free movement. Check brake bands, differential brakes, and mechanisms for sharp turning.

Clutch.- If adjustment won't put the clutch in first-class working order, let a shop-man see it.

Starting and lighting system.- Once a week or oftener check the liquid level in the batteries; maintain a 1/2-inch depth over plates by pouring in clean soft water. Do not overfill. Remove battery connections if corroded, clean, smear with cup grease or vaseline, and replace. Check starting motor and generator, keep commutator segments clean and brushes in good contact. Dust and oil must not accumulate here. A rough commutator needs smoothing or turning in a lathe by one familiar with the work.

Keep all wiring connections tight and in good order. It's easy to do and even easier to overlook.

Miscellaneous.- Check the drawbar. Be on the lookout for loose, broken, or missing bolts and parts anywhere on the machine. Remember it is a source of power and, therefore, doubly important. Take care of the tires by having any cuts or gashes fixed, and inflate to the pressure recommended. Be on the lookout for unfamiliar noises such as knocks, rattles, and hisses. Stop, listen, investigate.

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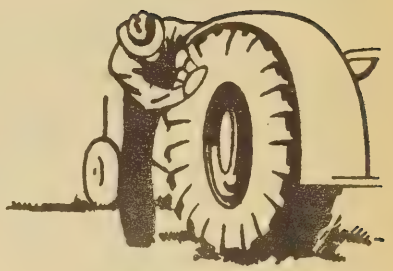
This leaflet and many others by the engineers of the Agricultural Research Administration, U. S. Department of Agriculture, and of your State college of agriculture are available from your county agent.

Prepared by R. B. Gray, Agricultural Engineer, Agricultural Research Administration, U. S. Department of Agriculture.

THE BETTER THE TRACTOR THE BETTER THE JOB



The tractor manufacturer's instruction book is the daytime flashlight that simplifies repair, adjustment, and replacement.

To see if valves are stuck or a valve-grinding job is necessary, crank the engine slowly by hand with ignition off; if there is a rebound on each compression stroke the valves are tight. If any of the compression strokes develop no resistance, then the valves of those cylinders are leaking. Warm up the engine before making this test. If kerosene applied to the valve stems and guides does not remedy the trouble and there is ample clearance between valve stems and tappets, valve grinding may be necessary. If there is a heavy hissing noise in the crankcase on any compression stroke then the trouble probably is a scored cylinder or sticky rings. Check clearance between valve stems and tappets and adjust, if necessary, to that recommended by the manufacturer.

The little hole in the fuel-tank cap is important. See that it is not clogged; also that the sediment trap is free of water and dirt, that fuel passes freely through the pipes to the carburetor, and that all connections are tight and pipes secured to prevent vibration and breakage. The carburetor check valve must seat properly so that it will not leak. If the valve seats properly but leaking continues, the fuel level is too high and the float needs attention. Clean or replace the filter in the air cleaner.

Ignition system.-Tighten loose connections and replace broken wires, including those in which the break does not show through the insulation. Clean spark plug porcelains, replace broken insulators, and adjust point separation to thickness of a thin dime. Check the spark timing and make sure the impulse starter functions properly. Tripping for starting the engine should occur just after upper dead center (outer on horizontal engines). The impulse starter should release after engine speeds up.

Magneto breaker points need to be clean and free of pits and from 0.012 to 0.015 inch apart when completely open, and the breaker arm must move freely. Distributor contacts and brushes will make trouble if not clean. SPECIAL CAUTION: Should it be necessary to remove high tension wires replace them just as they came off; otherwise the sparks will not occur in the cylinders in proper sequence.

In oiling follow the manufacturer's instructions, otherwise there will be rapidly worn or burned out bearings, scored pistons and cylinders and stuck pistons, and costly repairs. Hunt out leaks in crankcase gaskets, oil pipes, or connections. Clean crankcase breather caps and replace or clean oil filter or cleaner. See that the oil indicator works. To be sure of other important lubrication, check oil in transmission and differential cases and wheel bearings and clean and oil as nessecary. Engine main bearings and connecting rod bearings can be tested for play through crankcase hand holes or by dropping oil pan. To the experienced ear, loose connecting rod and main bearings, pistons, and piston pins are distinguishable while engine is running. While the transmission cover is off, check the gear shift, power take-off, and other mechanisms for proper functioning, and make needed adjustments.

Cooling system.-Radiator cooling fins are great collectors of dirt which restricts circulation of air. Clean them and clean out radiator and cylinder jackets with water or, if badly limed, with a special solution. Open clogged tubes and repair any leaks. Replace any faulty hose connections. Sometimes they are smooth on the outside but ragged inside; feel them. The fan bearing must have good lubrication and the belt shouldn't slip. If gear driven,

Farm Machinery Is Fighting Machinery

Care, share, and repair will help solve some of our equipment problems.

A few hours spent on care and repair, a few minutes on lubrication each day the machine is in use, will keep your fighting machines rolling.

This circular tells some of the ways you can keep your corn planters clicking. It was prepared by agricultural engineers of the Agricultural Research Administration, United States Department of Agriculture, and your State Extension Service.

Your county agent can help you with literature and advice. Ask him when you have a problem.

Prepared by C. K. Shedd, agricultural engineer, Agricultural Research Administration

Planting machines, because of the mechanization of most of the field operations that follow, might well be called precision implements. In this country the most important of them all is the corn planter, since corn is our biggest crop. Having the corn planter in tiptop working order before planting time is, therefore, a "must" on the well-managed farm.

The runners or furrow openers need sharp cutting edges; so if they have been worn dull have them built up at the shop or get new ones. Between seasons have them coated with grease to prevent rust. Sometimes the planter frame may be twisted so the furrow openers are out of line and checking is inaccurate. Look out for this and correct it. If disk furrow openers are used, sharpen if necessary, take the bearings apart, clean them, replace worn parts, pack with grease, and grease the disks.

Pay attention to working parts that have rusted; smooth them with steel wool, fine emery cloth, or sandpaper.

The planter's precision work depends in part on the working of the valves that drop the kernels finally into the furrow. On check-row planters see that they work freely, open to full width, and that those for the different rows open at exactly the same time. For drill planting be sure all valves are fastened wide open.

Cells in the seed plates used must be large enough to take the largest kernels of well-graded corn, otherwise the large ones will accumulate in the bottom of the seed box and stop the planting. The boxes should be watched and such accumulations removed whenever necessary. But the best insurance of even planting is careful grading of the seed and selection of the right plates.

In the bottom of the seed box are the cut-off and knocker. If the cut-off tends to crack kernels or to let too many get by, replace it and the spring with new parts. If not sure, give it a preliminary test. Also replace badly worn knockers; good ones reduce clogging and do their part for an even stand.

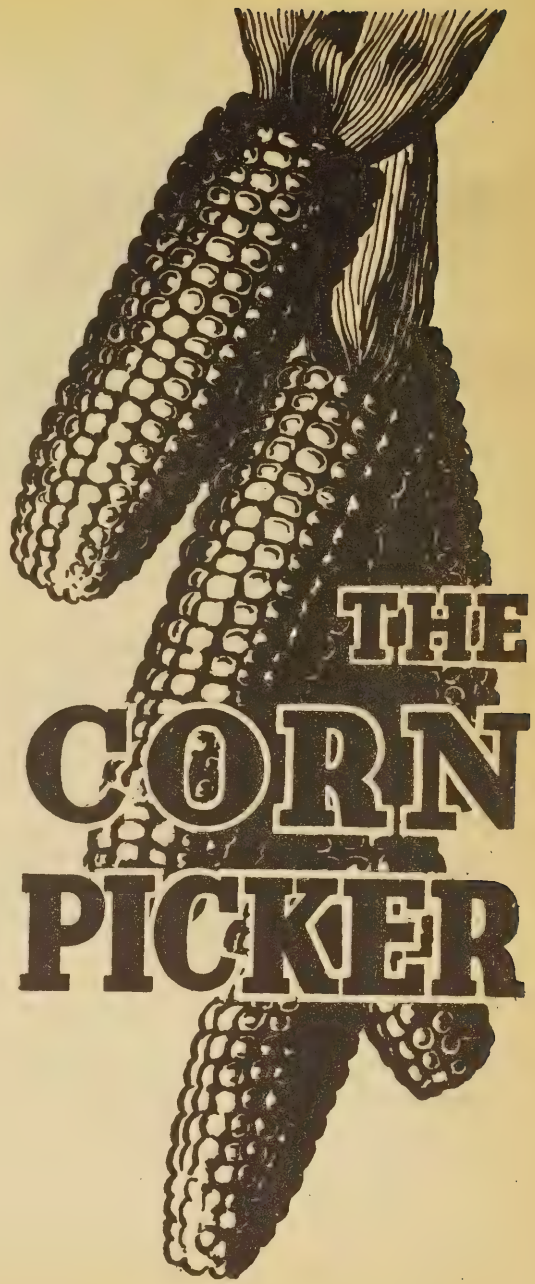
Badly worn check wire is uneconomical to use because breakage results in loss of time and a badly planted field. Replace if possible. Badly worn spools and rocker forks are bad for good planting and such spools should be replaced. However, the worn forks may be improved by being reversed -- a real saving in these times. If new spools are hard to get, worn ones may be fixed by welding on new metal and grinding down to shape.

Clutch parts may be out of condition because of dirt and grease. If they are worn badly, new parts should be put in.

To do an accurate job of check-rowing follow the manufacturer's instructions -- that is, in setting of stakes, adjustment of check heads and valves. Then drive straight.

Corn planter lubrication deserves special attention. The valve mechanisms that drop the seed into the furrow are designed to run without oil. The exposed bearings, unless fitted for pressure gun lubrication, get only light oil. Heavy oil gathers dirt and forms a grinding compound. When soil is gritty it may even be desirable to lubricate with kerosene or distillate. But kerosene used on metal between working seasons tends to cause rusting.

Remember that careful preparation makes the planter click.



Prepared by C. K. Shedd, Agricultural Research Administration,
U. S. Department of Agriculture.

Overhaul the corn picker well in advance of the harvesting season. In general, have all bolts tight, take up excessive play of moving parts, replace worn or broken parts, and lubricate bearings.

If either chains or sprockets are badly worn, both should be replaced. Adjust the tension of chains so that they will have a little slack. If a chain is gummed with dust or grease, take it off and clean it in gasoline or distillate. Then, to prevent rust, soak it in light oil, or brush it with oil and lubricate the joints. Sprockets out of alinement wear rapidly. Be careful to put chains back on just as they were. Each link has a pull side and a sloping side.

Gathering points need special attention because they run close to the ground and are subject to bending or breakage. Keep shield over power take-off shaft in good condition.

See that slip clutches are free from dirt and rust and tight enough for all ordinary working conditions. If the adjusting springs have been screwed down tight, probably some worn parts need to be replaced.

If it is necessary to remove either snapping or husking rollers, they must be put back "in time." Check the bearings for wear, and see that they operate freely and that the tension spring is at the right tension. If pegs are badly worn, replace with new ones that will take hold.

Check the bearings of the fan and replace any broken blades with new ones of the same make, so as to preserve balance. Clean and repack grease boxes.

Corn will be wasted if the picker is not kept accurately on the row. For the same reason the tension of the gathering chains should be adjusted frequently.

Shelled corn losses can be reduced by careful adjustment of snapping rollers. They should be as close together as possible without touching and without breaking stalks. When the corn is brittle, it may be necessary to set the rollers a little farther apart than when the corn is tough.

Store the corn picker in a dry building if possible. If it must stand outside, keep chains and other working parts coated with oil or grease and cover the machine with a tarpaulin.

If the pitman bearings have too much play, the knife will be jerked at each stroke and breakage may be expected. Since the knife bar and guides are exposed to dirt, they commonly wear faster than most other parts of the machine. Inspect the knife section and the shear plates for breakage or loose rivets. Sharp knives save power.

If any wheel rims or spokes are broken, have them repaired. Jack up the frame of the machine to take the weight off the wheels; then push and pull the wheel rims from side to side to check play in the bearings, which indicates wear. Bearings more than moderately worn must be replaced. Make sure that wheel bearings are properly lubricated. Check for breakage, parts bent out of shape, or out of adjustment.

Gathering chains require frequent adjustment of tension to keep them running with a little slack. If some bundles are missed, it may be because the twine is not uniform in thickness. Examine the band carefully, checking it with the trouble chart provided in the manufacturer's manual before attempting to correct this difficulty. In making adjustments try quarter turns rather than full turns, always remembering the starting point, so you can return to it in case the cause of trouble proves to be elsewhere. Where power take-off equipment is used, be sure all safety shields are in place on both tractor and binder.

Use the kind and quality of lubricants recommended by the manufacturer. Study the manufacturer's lubrication chart for your particular binder to make sure of finding all fittings. Some makers list a number of parts which should be lubricated at least twice each day of operation.

Store the binder in a dry building and coat the knotter and twine disk with grease. If the machine must stand outside, some protection can be given by oiling all chains and coating all bright metal parts with grease, but it should be covered with a tarpaulin if one is available. The knife should be stored indoors.

Prepared by C. K. Shedd, Agricultural Research Administration, U. S. Department of Agriculture.

Check over

THE CORN BINDER

The corn binder, along with most farm implements, has become more important than ever. Avoidable delays in the field are not tolerated by good farmers. They systematically check the binder to make sure no parts are broken or bent out of shape, all parts are in reasonably good working condition, free from caked dirt and grease, and in proper adjustment. The fact that the binder ran satisfactorily last year is no assurance that it will continue to do so without cleaning, adjustment, repair, or replacements. Another reason for special care with the machine this year is that binder twine is undergoing modifications and may vary considerably. Binders in good condition should handle it with less trouble.

Binder-head mechanisms give the most trouble in the field. The dog, trip latch, needle, disk, knife, bills, and discharge arms all work in definite timing with one another. Excessive wear or maladjustment of any one of these parts is liable to cause the others to function improperly. The adjustment and timing of the binder-head mechanism should be undertaken with care and according to the manufacturer's instructions.

In the knotter, look especially for wear caused by the twine in its travel from the holding can to the bills; frequently a groove will be found along the line which may cause trouble, especially with twine of irregular diameter. Examine carefully, too, the knotter cam and roller, and the small gears that drive the knotter and the twine disk. In replacing worn gears or other parts, look for timing marks; and, after installation, follow through with the binding operation by revolving the discharge arms by hand. Polish off any rust on the knotter or on the twine disk with fine sandpaper and grease these parts before storing the machine. Have the knife sharp. Follow the manufacturer's instructions on adjusting twine tension, twine disk, and knotter springs.

Inspect the needle to see if the twine has worn grooves in the eye. Such grooves can sometimes be fixed with a small, round file and emery cloth, but a badly grooved needle should be replaced with a new one. If the point of the needle has been bent up, it can be bent back to proper position. The needle is driven by a pitman with roller and cam. Wear in these driving parts shortens the stroke of the needle. Some wear can be compensated by altering the length of the pitman, but badly worn bearings or roller should be replaced. The needle must travel its full stroke to place the twine firmly in the knotter and twine disk.

The clutch engages and drives the binder-head for tying the bundle and disengages when the bundle has been tied. Wear in clutch parts may result in bundles of irregular size or in failure of the binder head to operate. See that rollers turn freely, and replace worn rollers, especially if worn flat.

When bearings become worn, gears may not be held in proper mesh, or sprockets may be out of alinement causing excessive wear or breakage. Bearings usually can be replaced at small expense.

Sprockets must be in proper alinement. If there is too much wear on the teeth, replace the sprockets with new ones. Badly worn sprocket teeth usually indicate that both the sprocket and the chain should be replaced, even if the chain appears to be in serviceable condition. Check chain tension and see that the gathering chains are in position to operate with the slope of the lugs to the rear.

Gear teeth should mesh to nearly full depth and the teeth on one gear should exactly parallel the teeth on the meshing gear. If gears do not mesh properly, the bearings are worn or out of adjustment.

Sugar is an important to industry and the civilian consumer as machinery is to the farmer. Thus the sugar beet planter should be regarded as of extra importance in these critical times.

You will find many suggestions in this leaflet which will help you get your planter in shape and keep it in shape. In a fresh reading of the instruction book that came with it, you will also find many things you had forgotten about the care of the planter.

This leaflet and others like it, prepared by engineers of the Agricultural Research Administration, U. S. Department of Agriculture and of your State agricultural college, will be found helpful in maintaining your equipment in operating condition.

Ask your county agent for leaflets, bulletins, and check lists covering all the kinds of equipment on your farm or ranch.

Prepared by E. M. Mervine, Agricultural Research Administration, U. S. Department of Agriculture.

For Beet Planters

adjustment's the thing

If one planter can be said to be more important than others, that one is the sugar beet planter. The stand of beets and the labor later required on the crop depend to a great extent on the accuracy of the seed-distributing mechanism and on the correct functioning of the furrow openers. Recent practice is to use American-grown seed, many of which are single-germ seed balls. Still more recently this seed has been "cracked," producing a seed for planting which runs about 70 percent single-germ seeds. In either case, it is desirable to plant at seeding rates of 2 to 7 pounds per acre instead of 20 as formerly. These lower seeding rates with more accurate spacing of single seed balls in the furrow make hand thinning much easier, make long-handed hoe thinning practicable, and make mechanical thinning possible.

With such gains possible through having a planter properly adjusted and in good condition, the following six suggestions are worth close attention:

1. Fluted feed planters may be used for planting segmented seed or small screened seed in quantities of 3 to 7 pounds per acre by adjusting the flutes to have approximately 3/32 inch of exposed surface for the smaller amount. This extremely small opening must be exactly the same for each furrow. Examine each opening, and if there is even a small difference, do away with it by taking up any lost motion or by inserting washers, or by filing off any undue length, or even move the seed box on its frame by enlarging the holes for its supporting bolts.

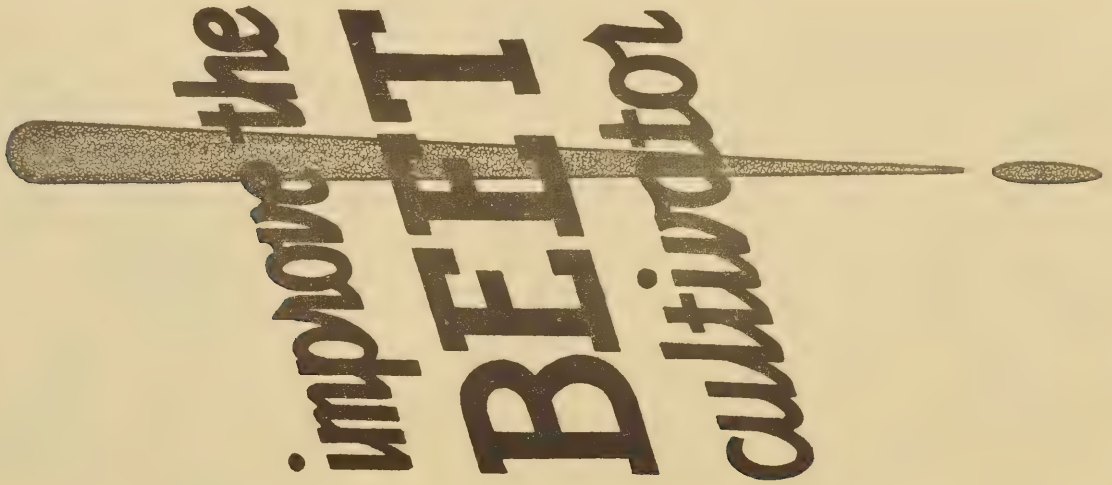
2. Plate feed planters may, in many cases, be equipped with special plates for use with "cracked" seed, or to obtain "single seed ball" planting. The local implement dealer knows whether it is possible to obtain such plates. In any case, before using a planter, it is desirable to clean out all the seed-dust accumulation and replace worn parts.

3. Calibration is more important than any other planter adjustment. Set the planter for the desired amount of seed per acre. Tie paper sacks on each of the seed tubes. Drive the planter 653 feet, if it is a four-row 20-inch-per-row planter. The ground covered is exactly 1/10 acre. For 22-inch rows drive 594 feet. Weigh the seed and make adjustments accordingly.

4. Furrow openers may cause improper planting. Disk openers give an improved stand, but with any type of opener, care should be taken that the passage from the hopper to the ground is free of obstruction. An accumulation of dirt, a protruding shoulder, or a bent seed tube will interfere with the steady and regular flow of seed. Be sure that the openers are spaced exactly right.

5. Grease all working parts, including the chains, not merely to insure longer life, but also to lower the draft. Especially is this desirable to prevent one side of the planter from working harder than the other, which gets rows out of line. The same result may be expected as a result of disk furrow openers failing to turn.

6. Wheels, frame, etc. See that no parts are broken, bent or badly worn; that bearings are properly lubricated; and that all moving parts work freely. Tighten all bolts and nuts and replace missing bolts.



UNITED STATES DEPARTMENT OF AGRICULTURE
EXTENSION SERVICE
WASHINGTON, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID
PAYMENT OF POSTAGE, $300

The object of cultivating sugar beets is, first, to eliminate weeds and, second, to leave the soil in good condition for thinning work and irrigating. Therefore, have the cultivators in condition to beat the weeds and fine the soil.

1. If the threads of clamp bolts for holding the shovel shanks are jammed, hold the bolt in a vise and run a die over the threads, or run a tap into the nut and apply oil to each one so that adjustments will be easy to make.

2. Take the shovels apart, and get the bolts to working by adding oil. Clean out the slots so that the adjustment desired can be attained later. Sharpen by having the cutting edge faced with very hard metal prepared for the purpose, and thus prolong the life of the shovel and maintain a cutting edge. To adjust shovels, set the cultivator on a smooth floor or place a board under the shovels. Adjust all shovels to the same depth and as nearly flat as possible so as to move no more soil than necessary. See that the row spacing is exactly right. These adjustments will probably have to be changed after cultivating is started, but with the parts all working easily changes can be readily made.

3. See that wheels are getting proper lubrication. If the lubrication system is not good enough, it may be desirable to drill and tap the boxing or cap for a pressure-gun grease fitting, to be sure that in the future it will be well lubricated. If bearing is badly worn, install new wheelboxes.

4. To eliminate the steering mechanisms' slack, start at its attachment at one wheel, replace the worn bolt at that point, and follow through at each pivot point, replacing each worn bolt. Occasionally the bolt hole is worn, and it can be reamed out to the size of a piece of pipe and the short section of pipe used as a bushing. A few minutes' work in reducing slack will be paid for by saving almost endless motion on a loose steering mechanism.

5. Aline the tongue if it is warped. Sight through the center of the cultivator and, if the front end of the tongue is off center, move the rear support of the tongue on its frame connection. This adjustment will make steering easier and, more important, will prevent cutting out beets from the rows.

Prepared by E. M. Mervine, Agricultural Research Administration, U. S. Department of Agriculture.

Cotton is going to be mighty important this year. We need not only the linters, but we need the oil and meal for war purposes.

Are you going to be ready when seeding time comes? Is your planter in shape? How long since you checked it?

Good machinery should have good care. This circular tells you what to do about caring for your planter. The recommendations have been written by agricultural engineers in the Agricultural Research Administration, United States Department of Agriculture. Your county agent will have other leaflets prepared by engineers in your State. Ask him for them and for a check list.

Pay particular attention to the parts about keeping the planter under cover and about oiling it. Get out the instruction book and read it again. You'll find it helpful.

KEEP 'EM ROLLING

Prepared by I. F. Reed, agricultural engineer, Agricultural Research Administration, United States Department of Agriculture.

COTTON PLANTER CARE

The purpose of the cotton planter, as of most other planting machines, is to put the seed down uniformly at the desired depth and cover it firmly. A planter in good mechanical condition and in proper adjustment will do this. Bearings, cranks, chains, sprockets, and gears are of top importance and must be fixed, replaced, or adjusted to be sure the machine will really run. Furrow openers, whether sword, shovel, or disk, may need only sharpening but possibly might need to be replaced.

As to hopper equipment, be sure to have on hand the parts, plates, picker wheels, peanut attachment, or anything else needed for the crops to be planted; and have the gears or sprockets to give the desired spacings of hills. If there is a fertilizer attachment, clean out the hopper and make sure all adjustments work freely. Calibrate the feed so as to insure putting down the desired amount of fertilizer. When rows are 3.5 feet apart adjust the hoppers to put down 0.80 pounds per 100 feet of row for each 100 pounds of fertilizer per acre. For 500 pounds per acre the hopper must put down 5 x 0.80 or 4 pounds per 100 feet of travel.

At night put the planter under cover or put a cover over the planter. Always keep it under cover when not in use. It will work better and last longer as a result. At the end of the season clean out hoppers, both seed and fertilizer. Oil bearings and the faces of furrow openers. Then check for worn or broken parts and order parts needed to put the planter in condition for next season's work. In this case being ahead helps the farmer to get ahead.

On many cotton farms a variable-depth planter is in use. It is designed to plant the seed at various depths, so that a good stand will result no matter what the weather is - hot or cold, dry or wet, or in between. The care of this machine does not differ essentially from that of other cotton planters. But if a machine gives especially valuable results its care and repair are just that much more important.

a time, should first be operated by hand to insure that all moving parts are free. Failure to observe this precaution may cause breakage at some point in the driving mechanism.

Examine for broken and badly worn parts and for parts weakened by corrosion.

Prepared by G. A. Cumings, Agricultural Research Administration, U. S. Department of Agriculture.

LOOK OVER THE TRANSPLANTER

Transplanters may be of the manual setting or the mechanical or automatic setting type. Most machines have watering attachments, too. Some have other features, such as fertilizer or check-row attachments, plant-spacing devices, and row markers.

The only moving parts of a hand transplanter are the valve at the bottom for releasing the plant and water valve. These parts should be checked to be sure that they move freely and close properly. Older units particularly should be inspected in advance of the transplanting period for repairs needed as a result of rust.

Checking systematically with the following points as a guide will help to prevent damage and delays at critical times:

1. Keep the machine clean; particularly, guard against soil and sand getting into the bearings, valves, and other places where excessive wear will result.

2. Protect all metal and wooden parts by painting as required except the polished surfaces of the soil-working tools, which should be protected by a coating of grease when not in regular use.

3. For adequate lubrication, clean out oil holes frequently. However, the manufacturer does not recommend lubrication of certain bearings which cannot be protected and therefore are subject to excessive abrasion by the sand and dirt held by the lubricant. Depend upon the manual for such directions.

4. Alinement is an important consideration on all these machines to insure proper operation. Any member of the machine should be straightened or moved if necessary to permit free movement of parts, and proper position and balance.

The chassis and heavy parts of the frame require little care and repair except protection and lubrication. Eventually, wear may require the replacement of some of the main shafts and bearings, and corrosion may require the replacement of bolts, pins, or cotter keys.

The polished surfaces on the furrowing shoe, pressure plates, and any other soil-working tools should be kept clean during operation and when not used from day to day should be greased to prevent corrosion. Examine gears, rollers, pins, guides, and other parts of the driving mechanism for excessive wear; fix and lubricate.

Keep foreign material out of the water tank, because it will clog the screen and water valve. If the water is not reasonably clean, it should be poured into the tank through a screen. The water valve at the shoe should be disassembled and thoroughly cleaned at the end of the season as well as examined for the need of new parts. A screen must be kept in place over the discharge opening of the tank at all times, to avoid clogging and operating difficulties at the delivery valve.

Most fertilizer materials greatly accelerate the corrosion of metal parts. Thus, unusual precaution must be exercised in keeping clean all parts with which the fertilizer comes in contact, especially if the surfaces are not well painted. Dry, loose fertilizer materials can be removed easily with a brush, but damp or hardened fertilizer may require the use of a water jet for complete removal.

When the machine is not in daily use, a coating of used oil or some other protective coating should be applied to the unpainted metal parts. On account of the corrosive action and the hardening of fertilizers, the distributing mechanism, after standing idle for

You don't use it much time out of a year, but -

When you do use it, you need it bad — but good!

Yes sir, if your grain drill isn't right up to snuff you may lose days getting your seed in.

NOW is the time to look it over, to check every part and make sure it's working.

NOW is the time to clean it and get it lubricated.

NOW is the time to replace the worn parts.

This circular, prepared by agricultural engineers of the Agricultural Research Administration, United States Department of Agriculture, and others prepared by the engineers of your State Extension Service, will help you get your machinery in shape for the battle of food production.

Ask your county agent when you need help.

Prepared by R. B. Gray, Agricultural Research Administration

Try out the GRAIN DRILL

Try out the grain drill as long as possible before it's needed. With one side blocked up, examine the working parts as the drive wheel is turned by hand. If the wheel turns with difficulty the grain or fertilizer feed shafts may be stuck. Loosen them by turning directly with a wrench. Forcing with the drive wheel may cause parts to break.

Clean and repair the hoppers, seed and fertilizer tubes, and seed and fertilizer feed controls. These are parts that frequently get jammed. Any hard fertilizer may be removed by applying warm water and should not be removed with force. Lubricate bearings of shafts or gears that drive the feed controls. See that all bolts are tight and frame is rigid so as to keep essential parts, particularly moving parts, in alinement.

Remove wheels from the main axle so that bearings can be easily cleaned and lubricated. If necessary, repair or replace pawls, ratchets, and pawl springs. In remounting the wheels be sure the pawls properly engage the wheel ratchets and that there is some play between the wheel and hub cap.

With one side blocked up and with feeding mechanism in gear, turn the free wheel slowly to note any excess play which, if not corrected, is liable to cause skips in planting.

In the case of two-piece axles, adjust their inner ends so that the tops of the drive wheels slope slightly away from the hopper.

Examine furrow openers, and tighten any loose connections. Remove the disks, clean and repair or adjust their bearings, and oil them. Loose bearings cause disks to wobble. Clean out the tubes to make them free flowing. Check tension of furrow-opener pressure springs. Try to have the pressure uniform. See that the disk scrapers are in repair and that scraper pressure springs work.

Examine the covering device. If drag chains are used see that all lost links are replaced. If press wheels do this work, inspect the bearings, adjust or replace if necessary, and oil.

It is important to have drive chains clean and adjusted to the right tension.

The surveyor or land-measuring device must be working but should run only when the drill is seeding, not when it is merely traveling.

All control levers must work easily and move parts as wanted.

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It is more important than ever before to keep all our equipment in tiptop running order.

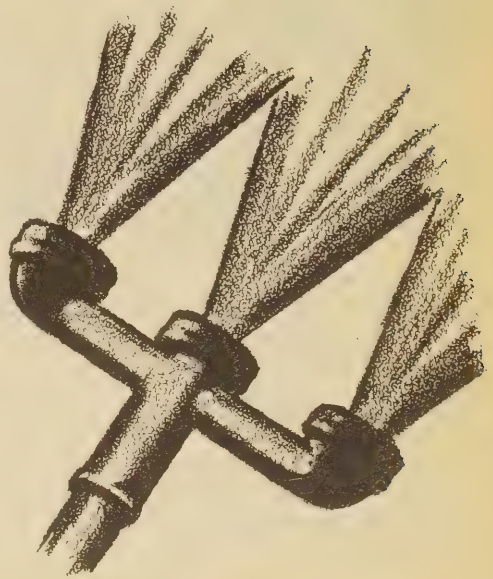
The suggestions in this leaflet, combined with a rereading of the instruction book, will help you have the sprayer ready for work when it is needed most.

This leaflet was prepared by engineers of the Agricultural Research Administration, U. S. Department of Agriculture. Others like it have been prepared by them and by the engineers at your State college of agriculture. They are intended to help you with your machinery problems.

Ask your county agent for helpful leaflets and bulletins covering every type of machinery on your farm.

Prepared by Frank Irons, agricultural engineer, Agricultural Research Administration, U. S. Department of Agriculture.

SPRAYERS *must spray*



SPRAYERS MUST SPRAY

Always keep the manufacturer's instruction book handy. Usually it is the best guide you have for repair and care. Instead of getting a new part, try first to have broken parts welded if they are not too badly worn. That saves metal, money, and time.

Here is a 9-point guide that applies to all sprayers. For specific instructions on your particular make of sprayer follow the manufacturer's recommendations:

1. Clean the machine thoroughly before starting the overhaul; repaint if necessary; coat with oil or grease parts subject to rust damage.
2. Overhaul the engine to get ample power for the pump. Check the governor, and adjust the engine to correct speed.
3. Inspect, adjust, clean, and lubricate all gears and chains. Aline sprockets. Clean chains and get tension right. Do the same with V-belts. Repair and adjust universals and sliding shafts and sleeves of power take-off drives.
4. Inspect frame and truck parts, especially for worn, missing, or loose bolts which must be replaced or tightened. Clean wheel bearings, and repack with grease.
5. Hoops of wood tanks often need to be tightened, but it is necessary to loosen them if the tank swells in use. Steel tanks may have rust spots, and these ought to be cleaned and coated with heavy grease or paint. The tank filler strainer is designed to prevent clogging trouble. Clean or replace if it has corroded badly or is broken.
6. The suction line to the pump also has a strainer to keep out material that might clog the nozzles. It should be in almost perfect condition or be replaced. It is nearly as important to stop any air leaks, and most can be remedied by tightening connections.
7. The pump is in reality the heart of the sprayer. The plunger packing or cups must be good or be replaced. If the porcelain lining of cylinder walls is worn through or scored install new cylinders. At the same time replace worn valve parts and leaky gaskets or make sure they don't leak. Some valve seats are reversible. Look for wear in all other working parts of the pump. Have a heart for your sprayer.
8. No part is more in need of being clean than the pressure regulator. Replace the diaphragm if it doesn't look good and refill oil pocket, if any. Valves and seats must be right and the packing around the top of the stem must be watertight. The maker's instruction book tells how to adjust the regulator and gives the pressure limit.
9. If nozzles are not right all the rest of the care and repair goes for nothing. Look out in each one for a worn disk orifice and worn whirl plate. Replace worn parts. Then straighten and repair any broken parts of spray booms. Go over the spray gun. Clean and drain the hose; if it looks weak get a new one. When hose is not in use, keep in a dark, cool place. You know it's rubber.

With sprayers pressure is about everything. But do not readjust the pressure regulator until you have considered these things:

1. Orifice in spray gun disk or orifices in boom nozzles may be worn oversize beyond the capacity of the pump. Try new disks in nozzles.
2. Speed of pump may be low.
3. Pump valves may be dirty or worn.
4. Plunger packing or cups may leak.
5. Suction screen may be clogged or line may leak air.
6. Valve above adjustable stem or regulator may not be working well.

At end of spray season wash out the rig and drain. Some manufacturers recommend that oil be pumped through to prevent corrosion.

Careful checking before a piece of equipment is needed in the field is the keynote of a successful farm machinery plan.

By following the suggestions in this leaflet and others like it prepared by engineers of the Agricultural Research Administration, U. S. Department of Agriculture, and of your State college of agriculture, you will be able to prevent many of the break-downs that might otherwise be experienced.

Ask your county agent for helpful leaflets, bulletins, and check lists covering all your farm machinery.

Prepared by Frank Irons, Agricultural Engineer, Agricultural Research Administration, U. S. Department of Agriculture.

CHECK THE DUSTER

Dusting of crops is usually done in relatively short periods, early in the morning or in the evening and occasionally at night. For this reason break-downs and delays are likely to be costly and should be avoided by timely attention to repair and maintenance. A systematic way to do this is outlined here:

Clean and repair the hopper, watch for dust leaks on sides or base, see that cover lid fits well. Check agitator parts for wear or breaks; if bent or sprung out of shape, straighten or replace. Inspect feed mechanism carefully, as this is a very important part of the machine. See that feed agitator has proper clearance over feed opening. Check action of feed control slide and lever. Clean and check bearings and dust seals and replace if needed. Dust seals must not allow dust to work through to bearings.

Remove fan case and fan of blower and clean off all dust scale or corrosion. A heavy coating of scale which frequently builds up on these parts with some dusts will cut down the efficiency of the blower. Check parts for abrasion. If fan blades are badly worn or broken replace entire fan. The fan is balanced for high speed; if repaired it may be thrown out of balance, resulting in undue vibration and damage to the machine. On machines having a single outlet fan case with distributor head, remove and clean out all dust scale. A heavy coating of dust in the distributor head will cause uneven distribution of dust to the conductor tubes. Thoroughly clean out any dust collected in these tubes. This can be done by tapping the tubes while operating the blower. Check tubes for leaks caused by dust abrasion or other causes. The tubes may be reversed and leaks repaired with friction tape if new tubes cannot be readily obtained.

Clean and repair nozzles and clamps. If sheet metal nozzles are bent, traighten to original shape.

Check gear drives for wear and proper mesh; adjust if possible. Clean chain drives, check for wear, and adjust to proper tension. Clean V-belts, and adjust for tension - they must be kept tight. Replace belt if needed.

Check the engine, and overhaul as required to deliver ample power. The engine on a duster is subject to damage from the dust and so requires special attention. Check the governor, and adjust the engine to drive the fan at the recommended speed.

Inspect all frame and truck parts for loose bolts and rivets, wear, and breakage. Check nozzle boom supports; straighten and repair. Check wheel bearings on truck-type dusters; repack with proper grease.

General suggestions for operation:

1. Lubricate regularly with the right lubricants in the right places
2. Check fan speeds frequently to maintain at recommended R.P.M. This is just as important as maintaining pressure with a sprayer.
3. If belt drive, check belt tension daily and keep belts tight.
4. Keep constant check on feed rate or rate of application of dust per acre. Different dust mixtures feed at different rates and require adjustment of feed opening.
5. Keep fan case, tubes, and nozzles free from dust deposit.
6. Keep machine moving at uniform forward speed; otherwise the dosage per acre will vary accordingly.
7. Operate when weather conditions are most favorable, if possible, but avoid delays in recommended schedules.
8. Keep nozzles properly set for row spacings and plant size.

employed to change cylinder speed, and be familiar with the procedure and use of the speed counter.

Separating and cleaning equipment varies greatly. Study the cross-section diagram, and follow through the separating and cleaning processes while inspecting the parts. Note the adjustments of parts of this unit, and familiarize yourself with the conditions under which these adjustments are used. Find all grease fittings and test them.

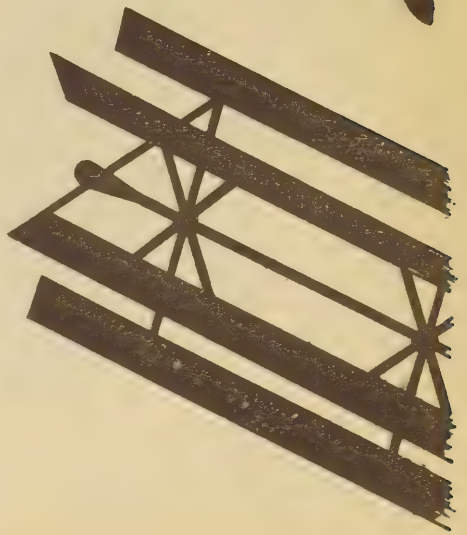
Combines have chains, pulleys, and belts that must be sound and carefully adjusted. Replace any sprockets excessively worn, and see that they are in line on the shafts. Adjust chains with a little slack, but not enough to cause the chain to ride the sprocket teeth or to jump off. Tight chains wear out quickly and result in friction on the bearings and increased draft on the machine. Belts should be adjusted tight enough to run without slippage, but not so tight as to spring the shafts.

In lubricating, first clean out all oil and grease left from last season's work, and fill with the grade of lubricant recommended by the manufacturer. Make sure the lubricant actually gets down into the bearings; watch for its appearance at the side of the bearing. Chains can best be cleaned by removing and dipping them several times in a bucket of kerosene, then dry well, and lubricate with an ordinary paint brush before storing. When operating in sections where the soil is sandy or gritty, chain and other friction parts are lubricated less frequently because of the abrasive action caused by a mixture of grit and oil. Under such conditions it may be that some of the oil and grease, given to metal parts for protection over the storage period, should be removed from the parts before the machine enters the field. Mineral oils and grease cause rubber belts to soften and wear rapidly so wipe them off with a rag wet with gasoline.

Between-season care has an important bearing on the life and future usefulness of the combine. By taking off the reel and header it is sometimes possible to get the machine into a weather-tight building with a good level floor and ample space for the winter servicing. Before putting up the machine for winter, it should be cleaned thoroughly as grease and other materials come off easier at that time. Remove belts and chains, clean and put them away in "safe" storage. Jack up the machine to save the rubber tires. List repair parts and order them far in advance of the next winter servicing.

Prepared by W. C. Hulburt, Agricultural Research Administration. U.S. Department of Agriculture.

Keep the COMBINE turning



In cutting, threshing, and cleaning small-grain crops in one operation, the combine saves about 85 percent of the man labor ordinarily used in the binder-thresher method.

To help the farmer, who has hired his threshing done until recent years, manufacturers of combines have prepared very complete service manuals for helping operators. There is a manual for each make and model built, and if the operator's copy has been misplaced he would do well to write at once for another.

Systematic checking reduces the chances of overlooking important parts. The header unit, which cuts the heads from the standing grain and conveys them to the threshing cylinder, is a good place to start. Check the cutting mechanism -- every section and guard -- and replace badly worn or damaged parts. Check the register of the sickle and adjust by the manufacturer's instructions until the sections match with the guards on dead center. Remove the sickle, and see that it is straight by sighting down the edge when it is properly supported. Tighten all guard bolts. Check the line of the guard plates by sighting down the bar. High guards can be brought down by the use of thin shims. Bring any low guards up into line by striking a sharp blow with the hammer on the thick portion. In straightening, place a heavy hammer or other weight back of the guard to prevent warping the bar by heavy blows. Then recheck by inserting the sickle, and see that a clean shear motion acts at each guard-plate edge. If there is a gap between some of the cutting edges, repeat the operation. See that the sickle clips have just enough clearance to prevent excessive wear. A similar allowance is desirable for the wearing plates. If a straight-edge section knife is used in place of a serrated one, see that the knife is properly sharpened.

Check the soundness of the pitman and see that the ball and socket connections are snug. See that oiling provisions are ample and operate freely. Note whether there is a rubber bushing connection on the knife head; if so, do not oil it. Follow the driving mechanism of the sickle to its source of power, and replace any bushings or connecters that show excessive wear. Check the reel's working parts and slats, and adjust the reel to the average travel speeds and settings recommended for the crop in the service manual. Note how reel variations are made to meet certain conditions, and also study the recommendations made for other crops that will be "combined" the coming season. If special driving sprockets are needed, be sure they are on hand.

See that the platform raising and lowering devices are in good working order; the successful operator knows the advantage of cutting just high enough to insure getting the grain with a minimum of straw.

Balance in the threshing cylinder is of utmost importance. Check the teeth or bars, and see that the concaves are set properly for the first crop combined. Note the recommended cylinder-concave arrangements for the various crops to be combined and see that teeth, bars, blanks, screens, etc., are on hand for all the need variations. If tangling in the cylinder has given trouble, get bars that close up the cylinder openings to reduce this packing. Take up the end play on the cylinder shaft and check the speed of the cylinder.

A speed counter is inexpensive and gives the cylinder revolutions per minute fairly accurately when used with the ordinary watch second hand. Do not trust to guess or sound, since many threshing ills can be traced to improper cylinder speed. Proper regulation of this speed is much more important now that combines handle various crops and thus require a wide range of cylinder speeds. Study the method

frame diagonally both ways. The two measurements should be the same.

10. The grain wheel may need a new bearing or a new boxing. It should run slightly under and in, toward the platform.

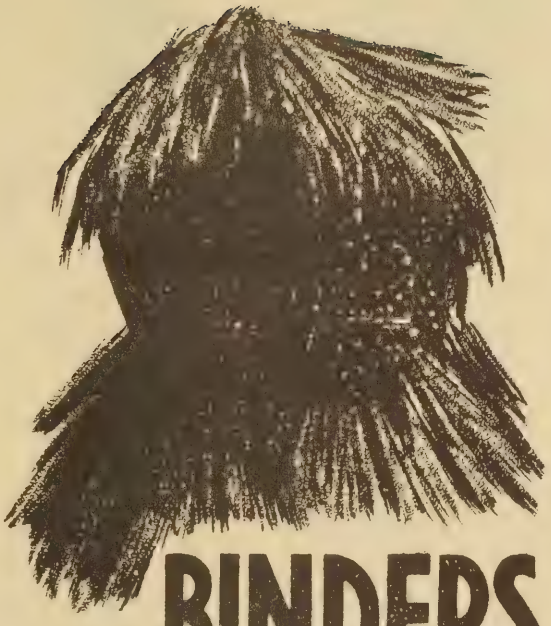
11. Replace broken reel slats and arms. Examine drive sprockets or gears for wear, and replace if necessary. The reel drive chain usually needs soaking with kerosene and must be installed hook first and open side out.

12. Packer arms may be worn and need adjustment, replacement, or rebushing.

13. The binder attachment may be worn at one or more of several places such as clutch dog, clutch rollers, needle eye, bearing surface on cam of knotter head, knotter bills or twine holder. Follow recommendations in the manufacturer's instruction book for repair or replacement.

14. See that all oil holes are open, and lubricate all moving parts according to manufacturer's directions.

Prepared by E. M. Mervine, Agricultural Research Administration, U.S. Department of Agriculture.



BINDERS MUST BIND

Even if earlier field work is pressing, it is good farming to get the binder into working order long before the grain begins to turn. The investment in growing the crop may be lost if there is failure in harvesting. The binder has many parts, so a systematic check-up is desirable. The following outline should make the check-up job easier to carry out without misses.

1. If canvases have worn edges, buy some webbing and reinforce the edges by riveting the new webbing to the slats. Replace broken slats. If a slat staple has pulled through the canvas, move it to a new position. Replace broken or worn straps.

2. With the binder on its transport wheels and the bull chain loose, the bull wheel can be pried in various directions to see if it is loose on its bearings. If it is too loose, remove old bearings and replace with new. The bull chain may be rusty. If so, flush it with kerosene or a light oil. If it is a link chain like the smaller chains, make sure it is traveling hook first with the open side of the hook on the outside. Chains traveling backward cause excessive wear and sometimes breakage. Tighten the chain after oiling.

3. If the bevel gear and pinion of the countershaft do not need replacing, only adjustment of the ball end-thrust bearing may be necessary to assure that the gears mesh properly. If the clutch jaws are worn, they may be taken off and filed to the proper angle or replaced.

4. The crankshaft sprocket may need replacing.

5. A new pitman pin may be needed to give the correct travel, or the pitman itself may be so badly worn that it should be replaced.

6. The sickle head may need to be replaced to insure that its correct travel is directly under a guard at the end of its stroke. Examine each sickle section--each guard--each ledger plate--and each clip for replacement, to see that they are tight and bearing properly.

7. The chain from the crankshaft delivers power to the rest of the binder; if rusty, soak it with kerosene. Have this chain run hook first, open side out. Chain sprockets may need replacing.

8. Gears on rollers may need replacing.

9. Rollers may be grooved or warped, have worn bearings, or be out of alinement. Check by measuring the

plates must be tight. If screens have rusted badly, replace with new material. Make sure all rockerarms and castings are adequately secured to the shoe and in good condition. Be sure machine adjustments or special equipment on hand give adequate agitation for the variety of crops to be threshed.

When auger troughs are found to be rusted through or nearly so, replace with new ones. Dents in troughs can be beaten out with a wooden mallet provided a wooden block is held opposite the dent to keep from warping the trough. If the auger bearings are badly worn, replace with new ones unless there is provision for taking up the wear.

The wind stacker assembly varies considerably with the different makes of machines and should be maintained and operated according to instructions in the manufacturer's manual. Never move the thresher on the road or for any distance in the field without first swinging the windstacker pipe around to rest on the deck of the thresher.

In general, check all bolts, nuts, and connections to see that they are tight. Do not overlook sprockets and chains, and pulleys and belts; see that they are in proper alinement and all shafts are straight. Adjust chains with a little slack, but not enough to cause the chain to ride the sprocket teeth; adjust belts tight enough so as to run without slippage, but not so tight as to spring the shaft.

When storing the thresher at the end of the season--in a structure with a good roof and side walls and level floor--clean it thoroughly with a stiff brush, both inside and out, to remove collections of chaff and dirt. The concaves should be removed from the holders and after cleaning should be gone over with a brush using machine oil as a protective coating. Coat all wearing metal parts with oil or grease and other parts with paint or linseed oil. If a tarpaulin cover is available, the machine should be covered with it as a protection from dirt and dampness, which cause rot or rust.

Repair all belts showing signs of weakness, clean others of collections of dirt and grease and roll up all of them and tie. Store leather belts in a dry place free of rats and mice. Rubber belts, if dirty, should be washed and stored in a dark, damp place. Keep mineral oils away from rubber belts. Clean chain belts by dipping in kerosene.

Prepared by W. R. Humphries, Agricultural Research Administration, U. S. Department of Agriculture.

THRESH WELL

Save time and grain

Although the binder and thresher method of harvesting grain has been almost entirely replaced by the "combine" in some sections, there are still well over 1 million binders in service on American farms, supplying bundles for threshing machines. The inspection and servicing of threshing is a big job, and plenty of time should be allowed for it.

The threshing cylinder is a good starting point for the check-up. Examine the teeth and replace any that are badly worn, bent, or broken. A light hammer on each tooth will reveal whether or not it needs to be tightened. Go over the teeth of the "concave" in the same manner. Then turn the cylinder by hand and make sure there is equal lateral clearance between the concave teeth and the cylinder teeth. Spaces too narrow cause cracking of the grain, and wide spaces result in poor threshing. The keys for holding the cylinder to the shaft must be tight and secure. If the plain bearings of the cylinder are worn, remove the shims and take up the bearings to a good, snug fit, but not so tight that the cylinder will not turn freely. If the shaft is scored, dress it down with a fine file. If bearings are antifriction, adjust if possible or replace if badly worn. See that a slight amount of end play is provided the cylinder, to avoid undue heating of bearings. About five one-thousandths of an inch, or the thickness of ordinary wrapping paper, is sufficient. If it has been necessary to replace many of the teeth, the cylinder should be taken out of the machine and balanced to insure quiet running and to prevent uneven wear on the bearings. The manufacturer's manual gives instructions on balancing.

Inspect the concave grates and see that all bolts and connections are tight, that adjustment devices are working, and that the fingers are straight. From 80 to 90 percent of the grain is usually separated at the concave grate, so its proper functioning is important.

See if the straw racks have any bent metal or broken wooden parts. The crankshafts which operate in high-grade roller bearings and the rack sections are held to the crankshaft by oil-treated hardwood boxings which need lubrication less frequently than do the other shaft bearings. When adjusting straw-rack wood boxings make sure they run freely; when too tight the crankshaft will overheat and the boxings will become tight and cause undue wear. If the machine is equipped with a chain rake or raddle see that the bearings are in good shape; also the slats and chains. Replace any broken or damaged slats with new ones.

Sharpen the band knives, and resharpen regularly to insure against clogging the cylinder with uncut bundles. Do not sharpen the toothed side of a knife.

Examine the volume feed controls and make sure they are in good working condition so as to avoid possible clogging of the threshing cylinder, a condition that causes much loss of time. Examine, too, the beater and beater bearings for condition and adjustment.

The shoe fan housing may be rusted through, if made of metal, or, if made of wood, boards may be broken. See that the fan blinds are in good condition, work freely, and that the locking device is effective. If fan bearings are worn take up the play by removing shims or by means provided. If adjustment cannot be made, replace the bearings. Replace any bad fan blades with new ones of the same weight obtained from the manufacturer. Have the windboard in good condition, so it responds to the adjustment mechanism.

The frames holding the chaffer and screens must not be warped, and corner clamps and

A mower is a mighty useful tool on any farm. It replaces 10 men with scythes, yet doesn't have to be fed or clothed. But it does require some care.

This circular, prepared by agricultural engineers of the Agricultural Research Administration, United States Department of Agriculture, tells you points to check about your mower and some things about the care of it. Get out your instruction book and see if you can't find some things in there you have forgotten.

Remember particularly that a mower needs lubrication. It is full of fast-moving parts, and that means plenty of wear unless oil is provided often enough to do some good.

If you are using members of the U.S. Crop Corps on your farm this summer, make sure they understand the importance of regular oiling. For their benefit, we've also included some safety suggestions.

Ask your county agent for other leaflets about your farm machinery.

Prepared by W. R. Humphries, Agricultural engineer, Agricultural Research Administration.

MAKE MOWERS MOW ...

Mowers are such active, hard-working machines that they will wear rapidly unless well adjusted, sharp, and kept thoroughly oiled. Start out by removing the drive wheels of a ground-driven mower and note the condition of the ratchets and pawls, bearings in wheel and on axle, oil seals, and clutch. Renew any bad parts. When remounting the wheels see that the pawls are put back in their proper relation and that the take-up washer and cotter pin are properly replaced. Keep in mind how the parts looked before they were taken down.

Test and adjust countershaft bearings and renew if badly worn. Adjust bevel gears, if necessary, to proper mesh. Check action of clutch and spring and replace if necessary.

Tighten wrist pin if loose - replace if out of round. Examine pitman; especially for cracks or splits and replace it if necessary. See that the bolts in both ends of the pitman are at proper tension.

See that all the many bolts in cutter bar are tight, that wearing plates and inner shoe are in good condition and adjustment, that knife holders are adjusted properly, and that guards are in alinement. With sickle removed, sight along the guard plates and make such adjustments as necessary to bring them into line.

To aline the cutter bar, block up the tongue in normal position of operation (front end of pole about 32 inches from ground on horse-drawn mowers) with inside shoe just floating. Then fasten a cord to the center of the top of the wrist pin box, stretch it over the center of the knife head, and extend beyond the outer end of the cutter bar. The center of the outer end of the knife should lead the center of the inner end by 1-1/4 inches for a 5-foot mower, or 1/4 inch for each foot of length of the cutter bar.

Replace all broken sickle sections and see that all are tight. In sharpening sections preserve the original shape and bevel. Check the sickle for "register" - that is, see that centers of sickle sections are opposite the centers of the guards when the knife is at the outer or inner end of its stroke. This adjustment can be made by changing the drag bar on some mowers or the eccentric on others.

All levers - and latches, too - must be made easy-working and dependable.

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SAFETY SUGGESTIONS

Never dismount without first throwing out the clutch.

Never stand in front of the mower bar, especially when the mower is horse-drawn.

Never use your fingers to clear the blade. Use a stick.

Never try to cut a stone or boulder. Lift the bar instead.

Don't try to run a mower without oil. Oil regularly.

When finished with the mower take the knife out, grease it, tie it to a board to protect the sharp edges, and store it in a safe place away from moisture.

Play safe and you'll never be sorry.

condition the POTATO DIGGER

Prepared by John W. Randolph, Agricultural Research Administration, U. S. Department of Agriculture.

Mechanical potato diggers must be in good repair and condition, not only to run well, but also to keep to a minimum the damage to potatoes resulting from cuts and bruises.

Dull shovels should be taken out and sharpened on an emery wheel. Be sure to keep the original bevel. Examine the shovel-lifting mechanism to see that it works freely, that all connections are secure, and to replace badly worn parts.

The elevator chain can be inspected and repaired by removing it from the digger. Replace worn rods and straighten bent rods. In replacing the chain, be sure to provide the right tension. If the chain is too tight, the draft of the digger is increased, and if too loose the upper loaded section of the chain may drag against the lower section.

Replace sprockets having worn or broken teeth, and see that these wheels are in proper alinement on the shaft. Make sure the agitator sprockets are well adapted for local digging conditions and are in good working order. Damaged or badly worn sprockets may be kept in serviceable condition by welding on new metal.

Wash out all bearings with kerosene, and replace any worn or broken ones. Since shaker-hanger and pitman bearings are subject to frequent replacement, it would be well to have some on hand at all times.

The main frame carries the shovel beam and shovel brackets at the front end, the main wheels at the rear end, and supports the elevator sideboards. Under heavy field going, the frame may become sprung out of alinement and seriously interfere with operation. Make sure the frame is square and properly alined, and that all frame connections are in good condition and tight.

Jack up the main wheels and eliminate any end play by inserting washers or by adjustment. Where power is transmitted from the main wheels, see that the wheel lugs are secure and in good condition. Power to operate a digger of this type is transmitted from main wheels by ratchet and pawls, which should be carefully inspected for wear and proper adjustment.

Inspect the drive-chain links and replace any that are worn. Take up excessive slack in this chains Correct any end play in the drive shaft by inserting washers or by adjustment provided for this purpose.

If the digger is operated by power take-off, see that all gears, bearings, and shafts are in good condition. See that the power shaft is not badly worn and that the universal joints and safety clutches are in good working condition. Drain the oil from the auto transmission and the gear box on the rear cross shaft, then flush and refill with the lubricant recommended by the manufacturers.

Proper lubrication of a mechanical digger is a problem, as there are many bearings working practically in the soil. Manufacturers' recommendations cover the care of bearings in abrasive soils as well as general lubrication problems.

If regular machine adjustments fail to reduce mechanical injuries to potatoes, chain links should be covered with padding and a canvas belt attached to the sides of the digger and blocked out to cover the chain hooks.

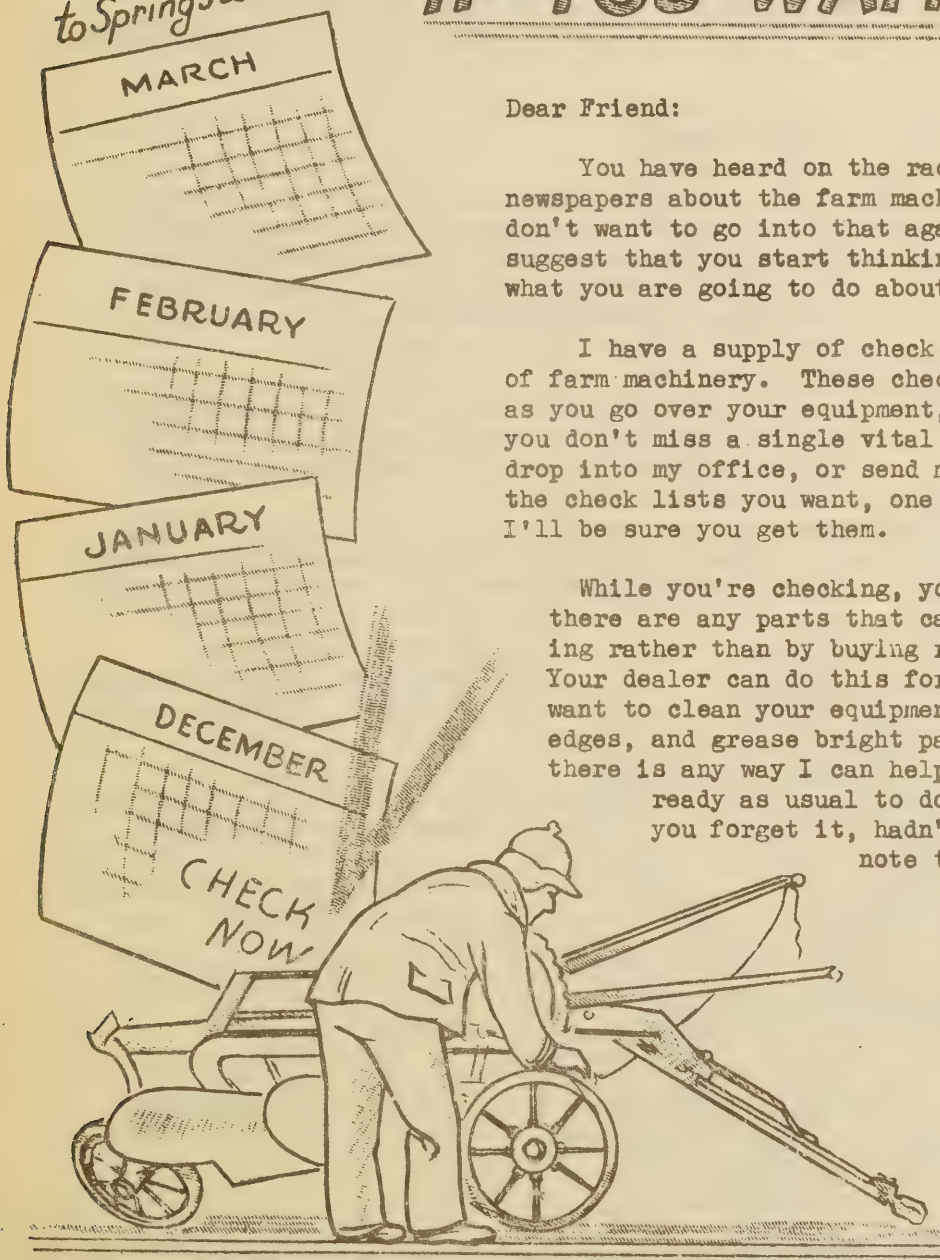
At the end of the season, clean the digger thoroughly to prevent the caking of soil in places where it might result in rust and other damage. Store out of the weather. Order parts early.

COLLEGE OF AGRICULTURE OF THE UNIVERSITY OF WISCONSIN
U. S. DEPARTMENT OF AGRICULTURE
COUNTY BOARD OF SUPERVISORS, CO-OPERATING

CO-OPERATIVE EXTENSION WORK
—IN—
AGRICULTURE AND HOME ECONOMICS
STATE OF WISCONSIN

AGRICULTURAL EXTENSION SERVICE
COUNTY AGRICULTURAL REPRESENTATIVE WORK

It'll be Too LATE IF YOU WAIT!



Dear Friend:

You have heard on the radio and read in the newspapers about the farm machinery situation. I don't want to go into that again. I do want to suggest that you start thinking this month about what you are going to do about it.

I have a supply of check lists for each piece of farm machinery. These check lists will help you as you go over your equipment, help you make sure you don't miss a single vital part. If you will drop into my office, or send me a post card listing the check lists you want, one for each machine, I'll be sure you get them.

While you're checking, you'll want to see if there are any parts that can be saved by rebuilding rather than by buying replacement parts. Your dealer can do this for you. You'll also want to clean your equipment, sharpen cutting edges, and grease bright parts with used oil. If there is any way I can help you with advice, I'm ready as usual to do all I can. Before you forget it, hadn't you better make a note to get the check lists?

Yours truly,

County Agent.

KEEP 'EM ROLLING ON THE FARM FRONT

CO-OPERATIVE EXTENSION WORK

—IN—

AGRICULTURE AND HOME ECONOMICS

STATE OF WISCONSIN

COLLEGE OF AGRICULTURE OF THE UNIVERSITY OF WISCONSIN

U. S. DEPARTMENT OF AGRICULTURE

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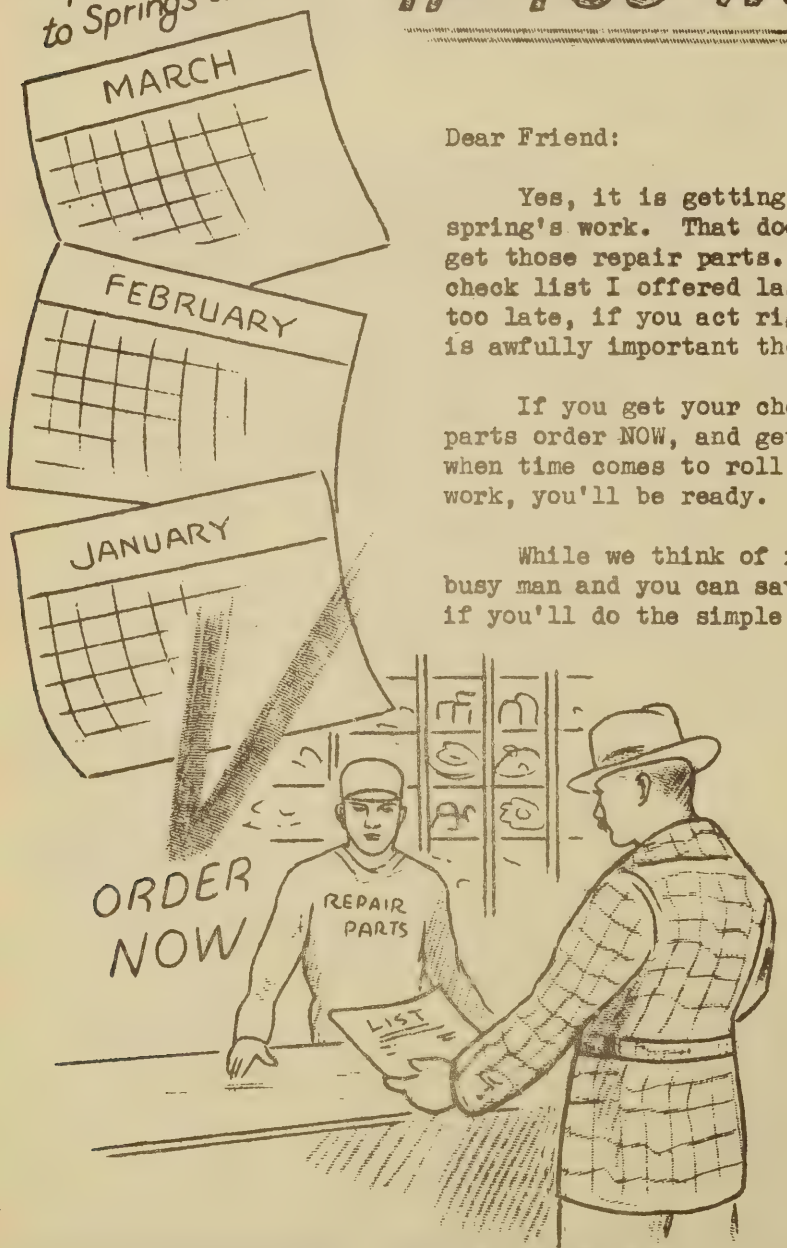

Dear Friend:

Yes, it is getting late. Only 3 months to spring's work. That doesn't leave much time to get those repair parts. If you didn't get the check list I offered last month, it still isn't too late, if you act right NOW. That word NOW is awfully important these days.

If you get your check list NOW, Make out your parts order NOW, and get it to your dealer NOW, when time comes to roll out and tackle the spring work, you'll be ready.

While we think of it, your dealer is a pretty busy man and you can save a lot of time and money if you'll do the simple repairs yourself, NOW. That will free his mechanics for the important jobs that require a mechanic's skill.

If you haven't checked your machinery, do it NOW.

If you haven't ordered your parts, do it NOW.

Very truly yours,

County Agent

KEEP EM ROLLING ON THE FARM FRONT

CO-OPERATIVE EXTENSION WORK
—IN—
AGRICULTURE AND HOME ECONOMICS
STATE OF WISCONSIN

COLLEGE OF AGRICULTURE OF THE UNIVERSITY OF WISCONSIN
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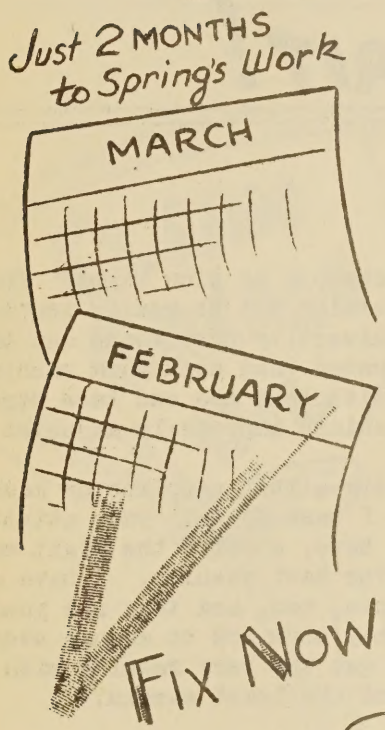

Dear Friend:

Only two months to go. That isn't long, the way time moves along these busy days. I guess you were one of the wise farmers who have checked their machines over and bought their parts. But have you put them in shape yet?

First thing we know spring will be here, and there just won't be time to do a good job of installing those new parts on the machines. This month is a good time to do that, in between the chores.

To help you on this important job, the engineers at the University have prepared a series of helpful leaflets about the different pieces of farm machinery. I have a supply of these, but in these war days we want to be sure every piece of printed material gets to a man who needs it. If you'll drop by the office the next time you're in town I'll be glad to show you the whole series and you can pick out the ones you need. There is no charge, of course, for these helpful Extension Service leaflets.

Be sure to drop in and get yours, and in the meantime, look over your machinery and be sure you have finished all the repairs you'll need.

Very truly yours,

County Agent

KEEP 'EM ROLLING ON THE FARM FRONT

CO-OPERATIVE EXTENSION WORK

—IN—

AGRICULTURE AND HOME ECONOMICS

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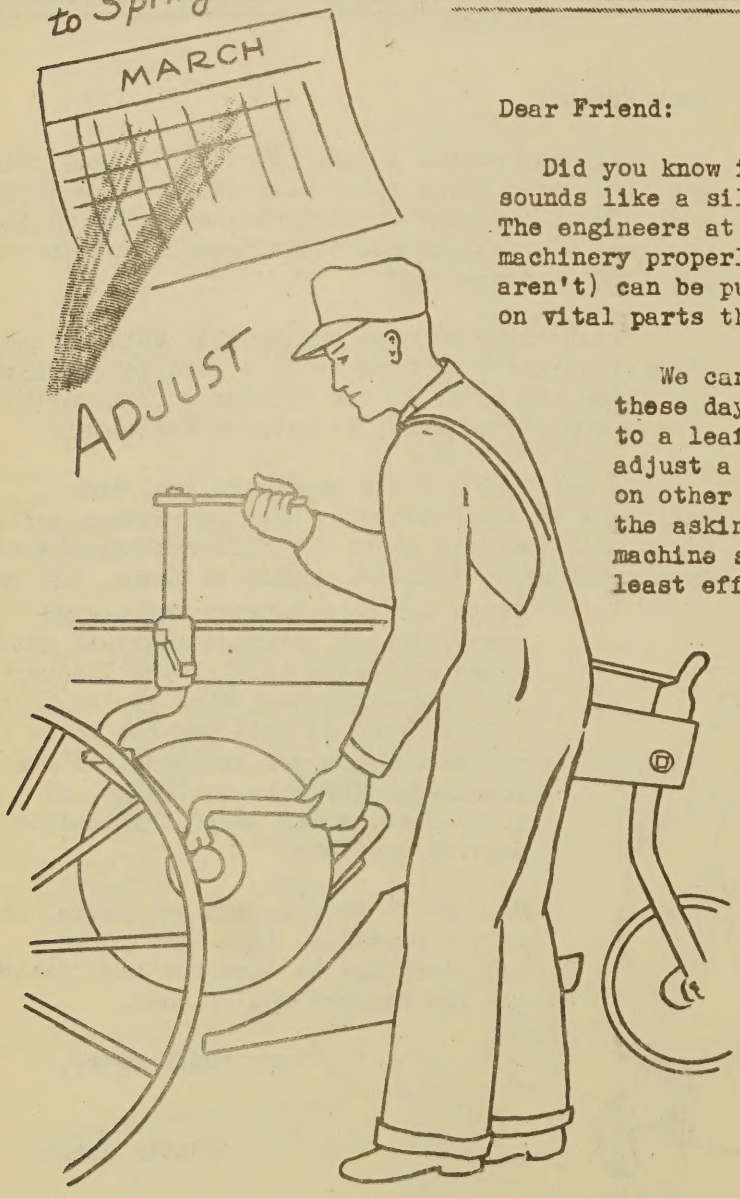
It'll be TOO LATE IF YOU WAIT!

ONE SHORT MONTH to Spring's Work



Dear Friend:

Did you know it is cheaper to plow right? That sounds like a silly question but it really isn't. The engineers at the University have found out that machinery properly adjusted (and most farm machines aren't) can be pulled with less gas and less strain on vital parts than machines improperly adjusted.

We can't waste either gasoline or machines these days, so I want to call your attention to a leaflet I have, showing the right way to adjust a plow for best results. I have others on other machines, too, and they are yours for the asking. They show how to adjust every machine so you get the best results with the least effort and the least strain.

I'm sure you'll want to look the whole series over so I'm saving yours here in the office against your next trip to town. You'll find them easy to understand, with lots of pictures showing just how to make the adjustments.

Drop in and get yours,

County Agent

KEEP 'EM ROLLING ON THE FARM FRONT

CO-OPERATIVE EXTENSION WORK
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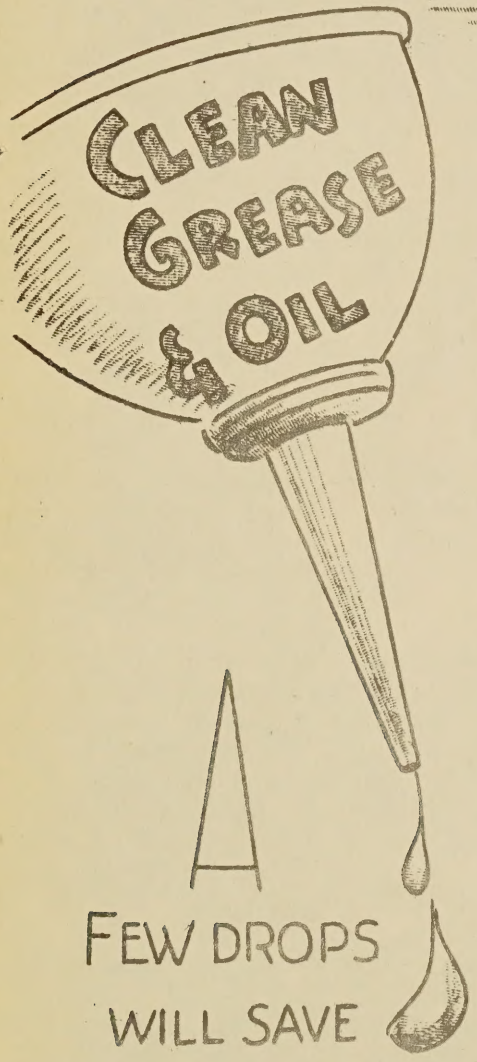
COUNTY AGRICULTURAL REPRESENTATIVE WORK

It'll be TOO LATE IF YOU WAIT!



Dear Friend:

The engineers have named it PM. That stands for Preventive Maintenance, a highfalutin name that simply means fixing it before it happens. The success of PM lies in cleanliness and lubrication.

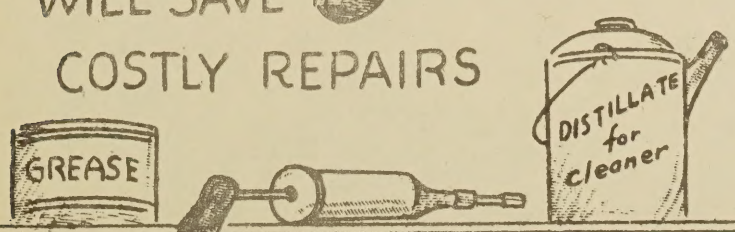
Farm machinery operates in the worst possible conditions. Dust, mud, and heavy loads cause lots of wear. By keeping down the effects of grit, and by oiling and greasing as we should, we can make machines last longer and be cheaper to operate.

American-operated tanks in the Libyan desert run four or five times as long as British-operated tanks. Why? Simply because our boys keep them clean and oiled. You can do the same with your farm weapons.

1. Read the instruction book again.
2. Follow a regular lubrication schedule.
3. Keep the radiator clean; avoid overheating.
4. Keep the air filter clean and working.
5. Keep the oil filter clean or recharge.
6. Use good oil and grease.
7. Clean off the oiling and greasing points before applying new lubricants.
8. Don't run the tractor too hot in summer.
9. Grease attachments as well as tractor and as often as needed.
10. Read the instruction book again--and again.

Yours truly,

County Agent



KEEP 'EM ROLLING ON THE FARM FRONT